Feeling the groove: shared time and its meanings for three jazz trios

Thesis

Feeling the groove: shared time and its meanings for three jazz trios

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Abstract

The notion of groove is fundamental to jazz culture and the term yields a rich set of understandings for jazz musicians. Within the literature, no single perspective on groove exists and many questions remain about the relationship between timing processes, phenomenal experience and musical structures in making sense of groove.

In this account, the experience and meaning of groove is theorised as emerging from two forms of sharedness. Firstly, a primary intersubjectivity that arises through the timing behaviours of the players; this could be likened to the 'mutual tuning-in' described in social phenomenology. It is proposed that this tuning-in is accomplished through the mechanism of entrainment. The second form of sharedness is understood as the shared temporal models, the cultural knowledge, that musicians make use of in their playing together.

Methodologically, this study makes use of detailed investigation of timing data from live performances by three jazz trios, framed by in-depth, semi-structured interview material and steers a new course between existing ethnographic work on jazz and more psychologically informed studies of timing.

The findings of the study point towards significant social and structural effects on the groove between players. The impact of musical role on groove and timing is demonstrated and significant temporal models, whose syntactic relations suggest musical proximity or distance, are shown to have a corresponding effect on timing within the trios. The musician's experience of groove is discussed as it relates to the objective timing data and reveals a complex set of understandings involving temporality, consciousness and communication.

In the light of these findings, groove is summarised as the feeling of entrainment, inflected through cultural models and expressed through the cultural norms of jazz.

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1 Introduction

'Just because a record has a groove

Don't make it in the groove

But you can tell right away at Letter A

When the people start to move'

Stevie Wonder, 'Sir Duke'

This is a study of jazz musicians grooving together. While for many, the word 'groove' may carry cartoon-like connotations of finger-snapping beatniks, for jazz musicians, being groovy is a serious business. The meanings and feelings that arise from playing good, shared time are palpable and achieving groove is a central part of the jazz aesthetic.

The richness of jazz interaction has been explored to great effect in the ethnographies of Ingrid Monson (1996) and Paul Berliner (1994). This thesis similarly studies interaction but as will be argued here, focuses on the most foundational element in performance, namely the microtimed relations between players. In the course of investigating the live performances of three jazz trios, integrated with in-depth interviews, the thesis will go on to examine the importance and subtleties of groove within jazz. It will show how the feeling of groove emerges from a fundamental process known as entrainment, and demonstrate the way in which 'being in time' is modulated through cultural norms and musical roles. At the same time, it develops an account of meaning-making that clarifies how the simple act of being in time together yields such significance for musicians.

1.1 Aims, questions and approach

The origins of the research questions within this report lie in my own experience of playing music and in having many conversations about time and groove with other musicians over the years. Such questions have become formalised in my work as a researcher and through my engagement with various perspectives within the literature on timing and jazz. These different perspectives have led me to ask questions about the world of musical timing as an embodied activity and a social process. How can the simple universal of playing together in time, become transformed into such an elaborate form of musical and social expression?

The nature of timing in musical performance has been skewed rather in favour of the idea that it exists in relation to a musical text (Repp, 1990; Sloboda, 1985). Much of the work within music psychology and musicology compares performance with notation and this approach satisfies a particular research need – that there is a concrete object against which performance can be measured. Whilst notation is an integral part of analysis concerned with larger rhythmic structures, it does not deal so well with my own area of interest, microtiming and groove. This sort of timing has been described as sub-syntactical (Progler, 1995), that is, below the level of conventionally notated durations. Other methods of analysis are required for investigation of micro-timing in performance and these are introduced in later sections of this work.

The analysis of larger scale structures in music has been shown to deepen our understanding of performance (Cook, 1990), however, my aim is to understand jazz performance better through an analysis of structures at the other end of the temporal spectrum. There is an impressive body of work that has looked at the nature of musical micro-timing and such work has generally examined the

expressive properties of timing as they affect listeners (Juslin, 2002; Juslin & Madison, 1999), and how expressive timing is affected by structure (Clarke, 1995; Friberg & Battel, 2002). Within this project, I hope to understand micro-timing and in particular groove, not only through the analysis of timing patterns themselves but also through the way in which musicians experience such patterns.

Another central concern of this work is the way in which players may derive meaning from groove. The problem of meaning within music affects musical analysis on so many levels (Clayton, 2001) and the degree to which musical meaning is embodied within its structures or is designative has been a central question within musicology (Addis, 1999; Goehr, 1992; Kramer, 2002; Meyer, 1956). While such concerns about music's meanings are important, the voice of the experiencing subject, the musician, often appears to be underplayed. The ways that jazz musicians talk about time show clearly that groove or the lack of it within performance is a matter of considerable significance to players and in this study, I am concerned with musical meaning as a shared intersubjective construction; how there is meaning for the agents in the act of being groovy together. My contention is that musicians' moment-by-moment playing and their relationships with others bring as much to the table in understanding musical meaning as the expressive structures of the sounds themselves.

Two overarching research questions therefore frame this study, asking 'What is the nature of groove?' and 'How do musicians derive meaning from it?'

Theoretical argument and analytical approach

Over the course of this thesis, I will develop an argument that groove needs to be understood as a dynamic, musical sharedness. While this approach does not deny

private experience in music, it does aim to prioritise musical experience and meaning through how music happens *between* people. In developing the idea of sharedness, I look to two distinct theoretical areas articulated as primary and secondary forms of intersubjectivity, and these are outlined here.

Firstly, I introduce the notion of primary intersubjectivity, an idea that emerges from the phenomenological literature to help explain our primary consciousness of others and also the grounding of our own selves in a social milieu. But how does this rather abstract conception of social being find its expression in groove? I examine the explanatory principle of entrainment and how this 'naturalises' the term intersubjectivity within the coordinated, embodied engagement of the players. Entrainment describes the universal tendency of components within biological, mechanical and social systems to become synchronised under certain conditions. In this case, musicians within a metrical framework and with their senses tuned to one another's musical and gestural movements can be understood as entrained.

Sharedness, however, exists beyond this primary, liminal form between musicians. It can be seen in the shared knowledge on which playing together is also based. Thus, I explore a second form of sharedness, the idea of cultural models which musicians make use of in their playing together.

Cultural models have developed as a construct within cognitive anthropology and form part of an attempt to understand culture in a more cognitively informed way. Such approaches have also sought to classify cultural knowledge as it is constrained by cognitive mechanisms. Borrowing this concept, I develop a taxonomy of temporal models that form part of the shared understandings needed for musicians to groove. These models also bring with them the sense of cognition being distributed socially. In a musical setting, one can clearly hear these sonic artifacts that add up to much more than the sum of their parts.

Such models out there in the world also have their counterpart in the structures of the mind. I draw on contemporary developments on the schematic, representational nature of thought which make use of an embodied approach to cognition. The work of Lakoff and Johnson, and more recently Barsalou, point to ways in which these fundamental schematic processes can be used to explain how meaning is derived from the coordinated moves of musicians as they groove with one another.

So how do I approach the analysis of groove? The study focuses on three jazz trios, each of which is active to a greater or lesser extent on the British jazz scene. My aim has been to elicit the quality of temporal detail that jazz timing studies have shown to be possible under controlled conditions but within entirely naturalistic settings thus avoiding the compromises involved in using commercial recordings or laboratory settings. To this end, public performances by these groups were recorded both in audio and video at different jazz clubs in the UK. The performance data were subsequently analysed through a range of methods and tools that will be detailed later on.

Subsequent to the performances, each of the musicians was interviewed, focusing on players' general thoughts about groove and shared timing and also on the particular extracts from performances that had been selected for detailed analysis.

Through the combination of detailed verbal reports and timing data, the study steers a new course between the existing ethnographic work on jazz and more psychologically informed studies of timing and sheds nuanced, experiential light on the theoretical argument of the thesis.

1.2 Studies of musical time and timing – research context

So what is distinct about musical time? In most instances of collaborative human activity, especially work activity, time is brought to bear across the board in measuring productivity, in allowing for the successful implementation of a plan, or just ensuring that we don't show up late to the office. In the case of musical work, time becomes something more than a stopwatch or a calendar and itself becomes one of the dimensions of the work to be accomplished. The temporal in music is no longer a measure of productivity so much as the product. But although musical time's attributes may appear straightforward to the musicians who are deeply involved with its production, any enquiry into the nature of musical time seems to hold quite as many aporias as enquiry into temporality in general.

David Epstein in his preface to 'Shaping Time' made the comment that 'Time is the critical element in performance' (1995, 3) and this critical element has begun to enjoy much more thorough attention from academic researchers within the last few decades. In this period, there have been a number of particularly fruitful approaches to the study of temporality in music. Such research has tended to be lined up along axes of production and reception as well as structure and agency. Common to a majority of the studies in these areas has been a psychologically informed approach to time and timing within music performance.

The approach of Lerdahl and Jackendoff drew inspiration from Chomsky's work on generative grammars (1965) and proposed a hierarchical set of rules to characterise how listeners would in principle hear structure in musical works within Western tonal music (Lerdahl & Jackendoff, 1983). As Clarke has commented, their contribution to understanding rhythm and timing was to clarify the 'elements

of rhythmic structure in music, particularly the distinction between grouping and meter', from which they outlined the participation of rhythm in listener's inferring of structure (1999, 478). Such clarifications have served as a springboard for a host of studies on rhythmic grouping and metre which have either used simulations or empirical methods to model perception of musical time (see Clarke, 1999, 478-497 for a full review).

Another tranche of studies has shifted the object of study away from the intuitions of listeners and much closer to performance. The vast majority of timing studies in music have been concerned with Western classical repertoire and the measurement of expression in performance. Many of the empirical data have been drawn from solo piano performance, from which timing data can be extracted relatively painlessly. There is a considerable volume of work in this area and it is not my intention to go through this here; suffice to say, extensive work has been carried out on 1) timing profiles in terms of their consistency between performances, their variability from player to player and the relationships to dynamics and structure (Repp, 1989; Repp, 1990), 2) models of expressive timing that have been proposed to highlight musical structure (Clarke, 1988), 3) models that clarify emotional intentions (Gabrielsson & Juslin, 1996; Laukka & Gabrielsson, 2000) and 4) attempts at a comprehensive understanding of expression within a single integrated theory such as the GERM model (Juslin, Friberg, & Bresin, 2001).

There are a much smaller number of empirically motivated studies that have examined timing in jazz. These have taken as their point of departure, either the ethnomusicological work of writers such as Charles Keil or the general range of work on expressive timing cited above.

From an expressive timing perspective, Rose examined the timing of a rhythm section from a jazz education recording, which with its adjusted stereo balance, allowed for isolation of the different instruments in the analysis. His principal analysis revealed 1) that particular patterns of lengthening and shortening took place in a systematic way; beats one and three were shortened whereas beats two and four were lengthened for all instruments, 2) that in contrast to the elasticity of interonset intervals within measures, sections (such as the eight bars of an A section within an AABA, 32 bar number) were remarkably consistent with one another and 3) that the ratio of the long-short eighth notes that make up a swing feel did not correspond directly to the idealised triplet ratio of 2:1 but instead came out at 2.38:1 (Rose, 1989; cited in Collier & Collier, 1996, 123).

Other studies have similarly used recordings to establish timing profiles for jazz musicians. Reinholdsson (1987) transcribed a Roy Haynes drum solo, input the transcription into a digitally realised form and then analysed the timings of the original against this transcribed form, thus using a similar sort of approach to score based examinations of expressive timing in classical music. Data were analysed for the degree of 'expressivity' in the solo and also the manner of Haynes' phrasing the swung eighth note (at a ratio of between 1.48 and 1.78:1, below the idealised triplet ratio).

Ellis' study of jazz timing, in contrast to the previous examples, used jazz saxophonists playing over an artificial backing to examine timing relations between soloists and rhythm section. This study revealed a distinct tendency amongst the soloists to phrase behind the rhythm section and demonstrated that the degree of 'behindness' varied with tempo; the swung eighth notes of each of the players was also studied and the overall mean of their playing a swung feel came out at around 1.7:1, once again revealing a gap between the idealised representation of the

swing feel in notation and the actual performance of this long-short pattern (Ellis, 1991).

The empirical approach adopted in these studies has contributed significantly to the understanding of timing in jazz – an understanding that had until the last twenty years been compromised through the lack of performance data. Before these types of study, writings about the temporal qualities heard in jazz and the interactions between players had largely been speculative if not metaphysical in character, Andre Hodeir's notion of the 'vital drive' in jazz being a case in point (1956,197).

At first glance, a study of groove as part of the expressive, temporal palette available to jazz musicians should find its niche comfortably within this range of timing literature. Indeed, much of this study *is* crucially concerned with timing but groove also seems to demand so much more than measurement. Taking my cue from conversations with jazz musicians over many years and the significant, though relatively small, ethnographic literature on jazz that has grown up over the last half century, I felt that any study of groove needed to include but also move beyond a study of timing data and ask questions about groove as a meaningful shared experience for musicians.

So while this project shares some of the concerns of these timing studies such as the relative timing positions of the players, the relationship between structure and timing, the expressive variability at the heart of jazz time and of course a concern for empirical data as the basis for the analysis, the scope of this present study is greater. There remains in my view, a lack of insight within these studies into the cultural forms from which the data emerge. This is in part a methodological problem; most studies of jazz timing tend to use pre-existing recordings and in studies where live musicians do contribute data, their performance is typically

controlled through the use of metronomes or synthesised backing tracks. Whilst this sort of control can provide a useful experimental ground, such interference also compromises its validity. In attempting to explore temporal interaction in as subtle and informed a way as possible, allowing musicians to reflect and comment on their own *real* performances, I attempt a much more profound analysis of timing, making full use of empirical data and its socio-cultural milieu.

The study of music as culture, ethnomusicology, is therefore a much more active disciplinary model within this study than the controlled or semi-controlled experimental model used within much music psychology. Temporality in jazz has been handled in no single manner by ethnomusicologists. The 'participatory discrepancy' school, developed by Keil has looked at groove as a means to understand musical significance and feeling (Keil, 1995). For Keil, the emphasis that many musicologists place on musical structure and syntax as a way in to musical meaning obscures the emergence of meaning through moment-by-moment dynamic change.

Ethnographers such as Monson (1996) and Berlin (1994) have examined groove as part of their wider interest in jazz culture and these approaches inform this study through their insistence on the centrality of musicians' thoughts about their cultural work; this approach stands in some contrast to the approaches of timing cited above which reduce the role of the musician to that of an almost remote producer of data. However, whilst broadly aligning my project with the work of the ethnomusicologists mentioned here, this piece of work goes beyond their work by virtue of the theoretical outline and analytical approach, and it is through these that I hope to make a significant contribution to studies of jazz performance.

While the term 'groove' forms part of the working vocabulary for musicians in jazz and other popular music scenes, it can appear a rather ineffable component of

performance to those outside these genres and so it seems appropriate to lay out a preliminary view of how groove is understood within jazz culture.

1.3 Groove and temporality in jazz

Preliminary understandings of groove

The co-ordinated timing of events is naturally important for all music but certain cultures appear to value the timed elements within performance over harmonic or melodic aspects (Pressing, 2002). The different genres within the family of Black Atlantic rhythms, which includes Cuban, Brazilian, and Afro-American popular styles, all share this highlighting of the temporal. Within jazz culture, this awareness of musical time and timing appears particularly acute and much attention is paid by players to the quality of their temporal engagement. This is manifest in the language of jazz which foregrounds these rhythmic aspects of playing and the sense of cooperation involved in communal timekeeping. I paraphrase Monson's commenting that it is not that the harmony and melody are diminished in importance when musicians talk of time being central; rather it is that time becomes the key framework for musical excellence rather than, for example, large-scale tonal organization as would be the case in much Western classical music (1996).

This shared timing of the players forms a uniquely expressive ground over which more overt musical gesture can be played out and forms part of the experience of a mutual tuning-in between players; this mutual tuning-in comes close to describing the feeling of groove that players talk about.

The use of 'groove' as a musical term seems to emerge within the jazz scene of the late 1930s. At least, that is when it makes its first appearance as a song title on record ('In the Groove' by Andy Kirk, 1937, cited by Kernfeld, 2006). Since the appearance of the word, it has tended to be used in quite different ways as indicated by the definitions offered by Grove Music Online (Kernfeld, 2006). The term warrants only a few paragraphs in Grove and is introduced in the article as a 'persistently repeated pattern' in jazz; in other words, an ostinato. The Grove article then elaborates by commenting on the term's elusive quality, its connection with movement and its being understood by musicians as a qualitative feeling about the performed music; this brief article ends by focusing more narrowly on groove as a stylistic device within much late 20th century dance music moving the term to its meaning as a noun, i.e., 'this is a funk groove'.

Such an article highlights how 'groove' enjoys no single pithy definition. The key distinction between its various meanings lies in its being used as a substantive term such as the 'funk groove' mentioned above and as the description of a physically engaged, positive feeling that musicians experience within performance.

Some researchers have focused much more on the sense of groove in its substantive form, seeing it as a set of coordinated patterns – almost a musical object. Harris Berger explores this meaning of groove in his work on the phenomenology of musical experience within jazz and rock, defining groove as 'a pattern of accents and timbres that is layered on top of the time signature' (1999, 98). Similarly Jeff Pressing has examined groove in terms of its structures rather than its feeling. He argues that groove forms a 'kinetic framework for reliable prediction of events and time pattern communication; its power cemented by repetition and engendered movement' (Pressing, 2002, 285).

Within the ethnographic literature on jazz, the reports of musicians move the notion of groove away from dictionary definitions, and there begins to emerge a more nuanced view of this key concept in the music. Ingrid Monson, in her groundbreaking analysis of jazz improvisation places musicians' interpretations of their practice at the heart of her analysis and in both her work and Paul Berliner's panoramic study of the jazz life, musicians' understandings of groove are given some considerable analysis and space (Berliner, 1994; Monson, 1996). Monson's analysis acknowledges the brief definitions given above that allow for groove to be understood in a nominative sense and also in the sense of it being a feeling, although it is with the latter sense that Monson is most concerned (ibid, 66-69).

A number of interviewees in Berliner's and Monson's work articulated thoughts that will emerge in a similar fashion from the participants in this study. Firstly, that groove has a strongly interpersonal character. Respondents to Monson's questions about groove likened it 'to "walking down the street"....to a romantic or familial relationship...to walking arm-in-arm with someone' (ibid, 68) and other figurative descriptions of mutuality. Perhaps most memorably, Charlie Persip, a famous American jazz drummer, spoke in Berliner's book of a good groove between the members of the rhythm section in these colourful terms,

> 'For things to happen beautifully in the ensemble, the drummer and the bass player must be married. When I listen to the drummer and the bass player together, I like to hear wedding bells' (1994, 349).

Another theme that emerged in Monson's work was the sense of groove engendering a feeling of ease or even a trance-like state so that the experience of playing became in the words of one musician 'so relaxed that they weren't forcing anything out' (1996, 68).

The sense of groove in performance is clearly powerful for jazz musicians – why else speak of marriage? At a deep level it speaks of a shared world and its significance. Groove does not have to occur through conditions of friendship but it does speak of our human need to be in step with others.

Although groove is the main focus of this work, other terms also have their place in this study and it's useful to lay out my understanding of the other key words within jazz argot that share a close relationship with groove.

Temporality within jazz discourse

If the sounds of jazz themselves have tended to be exoticised, then much of the language of jazz also has an 'otherness' about it. Ingrid Monson introduced her work on jazz improvisation by raising some of the difficulties in presenting the language of a sub-cultural group to a broader audience (1996, 20-24). Monson's work is examined in detail in Chapter 2 but here I want to look at the specific issue of language use on which she comments. Perhaps her thoughts are relevant only to the American jazz scene but this raises a general point about how to accurately present the technical vocabulary of a music when it is characterised in a rather different way within the larger society. For example, the relationship in usage between musician and non-musician of terms such as 'groove' and 'swing' is rather similar to the technical use of the finger click to bring a band in and its comic 'that's cool, man' usage within broader society. While 'groove' and 'swing' have a significant place within the working language of the music, it is fair to say that they enjoy this rather different, perhaps humorous resonance in the wider world, especially in the portrayal of jazz by the media. For that reason, it is worth

clarifying the range of temporal terms used by jazz musicians and make clear how I use them in this study.

In the same way that groove has multiple meanings, so the term 'swing' has different connotations. It refers to a stylistic era within jazz, to the long-short rhythmic division of the quarter note which is characteristic of the music, and finally to the feeling of a motional, charged drive which is close to the meaning of 'groove'.

The intertwining of both 'swing' and 'groove' to reflect the feeling of the music for participants, and the fact that each term carries within itself multiple meanings (of rhythmic structure and rhythmic process) should alert us to the fact that within the world of playing, structure and process may be less separable than is commonly stated.

Just as 'groove' and 'swing' partially overlap in meaning, so 'time' within jazz musicians' language appears to have a connection with groove but is not identical with it, indeed 'time' enjoys some quite distinct meanings of its own. For a jazz rhythm section, the instruction to 'Play time' simply refers to playing within the jazz idiom (as opposed to, for instance, a latin or funk idiom). Any rhythm section member would understand this to mean their playing a walking bass line, the archetypal ride cymbal pattern and an appropriate accompaniment from the piano (known in jazz as 'comping').

There are however two other principal distinctions that I would make between the terms 'groove' and 'time' which have significance for musicians. The first lies in the difference between the individual and the group. Most commonly, 'time' is used when describing a player's competence in keeping a steady pulse. Monson summarises 'good time' commenting that 'A jazz musician is said to have good time if his or her underlying pulse is steady, strong, and infectious, with emphasis

on the latter...' (1996, 28). So while the effect of good time may be similar to the way in which groove is motionally effective, it tends to be associated with an individual's rhythmic drive. As one of Monson's respondents point out however, good time is not simply about the accurate placement of the beat; it also implies an inner security that allows the player to work against their inner clock and play 'with' the time at certain points in the music without losing their place or sacrificing the overall feel of the music (ibid, 28). The musician might be said to have a particular schema of the time, a template against which their performed time may be changed in subtle ways. In contrast to this idea of personal 'time', groove implies the working of these individual time patterns towards a group feeling. Groove can *only* exist as the relationship between two or more timings and how these are felt. What makes groove so intriguing within musical performance is its penumbral position; it seems to lie somewhere between fully shared understanding and private meaning, between measurable events and phenomenal appearance and between structures and process.

1.4 Summary

This introduction has briefly laid out the trajectory for this study, acknowledging the terms of reference, the theoretical context and the analysis that will come into play. Throughout this introduction, I have emphasised my concern to understand groove not simply in terms of numerical data but as a centrally meaningful constituent of collective music-making. Sharedness and the ways in which collectivity in performance is meaningful are the key themes of this work and I begin to address these themes in the next chapter by examining some of the ways that scholars

have approached musical meaning. To discuss this question, I invoke the metaphor of language and its various analogous relations to music as the theme for this exploration. Setting out some contrasting approaches to musical meaning, I bring the chapter to a pragmatic conclusion, looking at those approaches that see meaning as something achieved in action rather than inherent in the musical trace.

In Chapter 3, I move the discussion on to the theoretical foundations of sharedness in music-making. If we are able to play together and understand musical meanings at all, then what are the pre-conditions of such communication between us? The theoretical framework for this chapter is the idea of intersubjectivity. Intersubjectivity is classically associated with the work of phenomenologists and forms part of the philosophical project to understand the nature of our knowing the world and its others. I present an argument for intersubjectivity in music, not as an abstract knowledge of other minds, but rather as a 'naturalised' condition that emerges through bodily entrainment between conspecifics. Entrainment occurs in many biological systems when two or more independent oscillators become attuned to one another. This universal tendency is regarded by many biologists, neuroscientists, and cognitive scientists as a fundamental dynamic mode of living systems including man.

The process of entrainment allows for the intersubjective attunement between musicians at a fundamental level but playing music together also involves shared knowledge. In Chapter 4, I look at the notion of the cultural model as a second layer of intersubjectivity and also examine the cognitive equivalent of such models, the schema.

Cultural models are the shared understandings that people in communities make use of to be able to function. Theoretical approaches to these shared understandings are outlined before I examine the cognitive foundations of such

models. Particular theoretical orientations are discussed which suggest the mechanisms through which a shared activity such as music can become meaningful for its participants. I close the chapter with a specific example of the way in which groove has been 'modelled' in the literature.

With the theoretical foundations of this study laid out, in Chapter 5, I introduce the methodology for the collection and analysis of data. This sets out the way in which I approached the participants for the study and gives a detailed picture of the data collection which involved sophisticated audio-visual recording techniques and a semi-structured interview process. The chapter then goes on to describe the analytical techniques involving a range of software that were then brought to bear on the data.

In Chapters 6, 7, and 8, the interview and timing data are integrated within three discussions which culminate in an examination of groove and how the players derive meaning from it. Chapter 6 looks at the temporal preconditions of groove; firstly by examining players' individual timing profiles, then looking at player pairs within the trios and how role plays a part in timing relationships before finally examining tempo in the musical extracts. A picture is built up of timing within these groups based on their capacity to entrain together. In Chapter 7, I link the temporal data to the notion of the cultural model and explore how musicians in these performances make use of a variety of models that overtly or covertly structure the musical fabric. In Chapter 8, with the preconditions of groove established in the first two data chapters, groove as a group phenomenon is fully explored; the intertwining of the entrained behaviours of the players and the temporal models that they utilise is looked at, suggesting that there is no simple dichotomy between process and structure in groove. While the sounded groove of the players and their reflections on this is the central focus of the chapter, I bring in a visual

dimension showing the multi-modal experience of groove. Before my conclusion in Chapter 9, I end the data analysis with a discussion of the way in which the theoretical perspectives on meaning generation in Chapter 4 are applicable to the words, sounds and body moves of the players in this study – the mechanisms through which groove becomes meaningful.

2 Approaching musical meaning

The human species is distinguished from other living things through its creative use and reflexive management of symbols. Second only to language, the humanly organised sounds of music stand pre-eminent across time and cultures as carriers for an inexhaustible supply of symbols and music's links with spoken language have been investigated within disciplines as diverse as neuroscience (Patel, 2003; Steinbeis & Koelsch, 2007) and evolutionary theory (Brown, 2001). From these different perspectives it appears that both sonic codes share much common cognitive ground. However, the nature of meaning within music is a much less certain affair than meaning in natural language and this has led to the many investigations of meaning in music yielding such a diverse set of approaches to uncovering its essential nature (Banbury, 1995; Berger, 1999; Clarke, 2001 ; Clarke, 2005; Clayton, 2001; Kramer, 2002; Langer, 1951; Meyer, 1956; Small, 1998). Rice identified a series of distinct understandings when using the word 'meaning', ranging from the technical descriptions of meaning within analytical philosophy, as a synonym for value, as a description of intention ('what does the composer mean?') and finally the idea that meaning involves understanding and interpretation (2001).

Others have suggested that it is music's very lack of specificity of meaning wherein lies its significance; Cross (2005) has argued that from a functional viewpoint, it is this capacity to embody an essential ambiguity, which Cross has labelled 'floating intentionality', that makes it an essential component of human

culture and cultural evolution (ibid, 38). Christopher Small moved the groundrules about questioning the nature of musical meaning and musical ontology by asserting that music is an *activity* rather than a *thing*, leading to his now accepted neologism 'musicking' as a rather ugly but effective way out of the 'music as object' perspective that proscribes so much debate in this area (1998).

Over the next three chapters, I develop an argument for musical meaning arising out of the relatively immediate interactions of the musicians as these are performed within the apperceptive backdrop of cultural understanding. In the first of these chapters, I want to briefly examine commonly developed tropes within musicology and related disciplines, which summon a sense of music as having language-like properties. Over this chapter, I look at different constructions of musical meaning which rely on its capacities to communicate in ways that suggest this correspondence with language. These four tropes are semantics, syntax, pragmatics and metapragmatics.

2.1 Semantics

The understanding of a profound and direct relation between music and language has been prominent in the ways in which music is theorised (Cook, 1990). This relationship between the two codes is visible in numerous ways; through the way in which generative linguistics became the foundation for Lerdahl and Jackendoff's account of structures in tonal music (Lerdahl & Jackendoff, 1983) and in the cognitive parallels between music and speech (Patel, 2003; Patel & Daniele, 2003). This intertwining is also found in the vernacular, metaphoric descriptions of music, for instance, 'they make the instrument speak'.

The idea that music and language are semantically analogous has been developed most fully by Deryck Cooke's proposal that music is a language of the emotions, one whose sounds possess a quite precise vocabulary through which Western tonal music is able to convey affect (1959); this position, emerging from Baroque theories of music, sees a firm relationship between particular emotions and melodic movements (Cook & Dibben, 2001). In putting forward an analogous connection between melodic forms and affective states, Cooke proposed that such melodic forms have an *intrinsic* availability for emotions. Cooke's view was that these connections are immanent within the music and do not require the mediating effect of words or repeated cultural associations between words and music to become instrumental. Within Western music, there is a commonly understood link between tonality and emotional valence, but Cooke's thesis is to take this much further so that the tensions inherent in pitch, rhythm and volume (particularly pitch) create a whole apparatus of musical expression, based on natural principles of harmonic tension. Cooke's work has been subject to considerable criticism. Firstly, that in making the case that music is a language, he not only misunderstands musical meaning but also linguistic meaning; in both cases, his view appears a rather naïve understanding of meaning as inherent in sounds themselves, be they words or music, rather than in their contextualised usage (Martin, 1995, 39). And, as noted by Sloboda (1985), Cooke's thesis that our emotional response to music is innate, when tested experimentally, did not appear to hold; musically untrained subjects in an experiment conducted by Daniel (1978; cited in Sloboda, 1985, 62) did not confirm Cooke's affective descriptions of particular melodic statements. A thesis that claims some measure of universality is deeply compromised when it also requires a serious amount of specialised Western education. When Cooke asks, 'Could it not be that some listeners are incapable of understanding the

feeling of the music properly?' he begins to undermine his own claims of music's universality and its capacity to unambiguously refer to emotions (1959, 21).

On a contemporary reading, Cooke's writing comes over as elitist. The claim that music is a universal language whose referent is emotion is compromised if only a narrow set of people with considerable formal training can properly access music's object. In this respect, his seeing music as a language becomes rather unconvincing. While linguistic competence is almost universally distributed amongst populations, musical competence is found amongst a much more restricted group. A further problem with Cooke's analysis lies in his almost mechanical reading of the nature of music's emotional meaning, relying on a view of musical communication that moves in a single direction from the composer to the listener; the listener is seen as a passive recipient of music's emotional content. As DeNora has pointed out, listeners are active in making sense of sounds and in the case of music, it is the polysemic nature of those sounds that in part encourages this active pursuit of meaning by the listener (DeNora, 1986).

Cooke's writing, for all its flaws, does however provoke many questions about how we are to understand the nature of musical communication and meaning. In particular he asks important questions of how shared understandings do arise when we engage with organised sounds.

2.2 Syntax

Though Leonard Meyer's 'Emotion and Meaning in Music' (1956) is as concerned with the affective status of music as Cooke's work, he constructs a more psychologically plausible account of how music can be aesthetically and emotionally powerful. If Deryck Cooke's approach has been to identify direct,

referential correspondence between sound events and emotion, then Meyer's work can be characterised from a syntactic perspective. For Meyer, the serial relations between sound events, the syntax of a work, set up much of the affective work that music accomplishes. Meyer's work on emotion and meaning in music has set a benchmark in the last fifty years on how to approach the nature of musical meaning to the extent that Kivy declared Meyer's work to be 'the book that taught many of us for the first time that you can talk about music without talking nonsense' (Kivy, 1987, 153: cited in Cook & Dibben, 2001, 57).

Meyer's understanding of musical meaning hinged on the fulfilment or otherwise of musical expectations leading to emotional or aesthetic response from the listener (1956). His account is structuralist in that he understands that meaning develops out of relationships contained solely within the form of the musical work (embodied meaning). In his view,

> 'It is pointless to ask what the intrinsic meaning of a single tone or a series of tones is. Purely as physical existences they are meaningless. They become meaningful only in so far as they point to, indicate, or imply something beyond themselves' (ibid, 34).

This is not to say that Meyer did not recognise the potential for music to signify through its referring to things outside the musical stimulus itself (designative meaning), but he attributes much less importance to referential meaning within his theory.

Although his statement above may appear to be leading towards a semiotic analysis, Meyer's treatment of meaning in music is built on psychological theories of emotion. According to Meyer, both emotional and aesthetic meanings are the outcome of a process of expectancy. It is in the distance between a listener's anticipation of a musical outcome and the outcome itself wherein the key to our

musical response lies. Meyer's theory is significant in that it was the first exploration of musical meaning that put forward a cogent psycho-acoustic explanation for how intra-musical relationships come to have meaning for listeners. Prior to Meyer's work, there had been relatively little outside aesthetic philosophy, for example, the work of Suzanne Langer, in attempting to account for the boundaries of musical meaning (1951).

The idea of meaning for Meyer develops out of an idealised listener's concern for outcome and in this way, the listener participates much more in the construction of meaning than Cooke allows. Events and expectation of future events are at first ambiguous – the story could go in a number of ways which may fit or not with the listener's expectation. As things unfold, then antecedents are interpreted in the light of the unfolding narrative and it is this causal chain that leads finally into an overarching sense of meaning for the piece; a process which is referred to as 'determinate meaning' (Meyer,1956, 38). In this sense, meaning has an architectural as well as a narrative quality, something that can be grasped not only in its temporal unfolding but also as part of structure.

Although he makes a clear distinction between an aesthetic and emotional response, both are informed by the same rules of expectancy allied to the normative effects of style within a culture. It is only the disposition or training of the listener that leads to one or other type of response having primacy. In his understanding of how meaning may be objectified, he articulates a difference between the experiencing of music and our reflection on that experience, so turning it into something more concrete and self-conscious; this reflection is triggered by the extent to which our experiences of music flow smoothly and it is only when our experience is disrupted in some way, perhaps through some

harmonic twist, that reflection is brought to bear on experience and the construction of meaning occurs.

Meyer's approach has proved long-lived and generated a considerable number of theoretical papers in its wake, for example, Eugene Narmour's 'implication-realization' model (1990) and Ockelfords' zygonic theory (2005). Critics of his position, such as Cook and Dibben (2001) have pointed to his theory's lack of specificity towards emotional engagement and made the case that while it is able to account for a general affective response towards music, it fails to register the complex of emotions that can be detected in listener responses (Juslin, 2002). Most importantly, Meyer's approach marginalises the referential; it pays too little attention to the links between music and external associations, and a full account of how music is meaningful must do more to explore how both the intrinsic and extrinsic are implicated.

2.3 Pragmatics

Meyer's contribution to understanding music and meaning cannot be over-emphasised but his syntactic approach to meaning has also led others to question its relevance when applied to music that may be profoundly affective but structurally mundane. It is at this point that I want to look at Charles Keil's work and his writing about groove which in some measure was formulated as a riposte to Meyer's work.

In his response to Meyer and the 'syntactic' approach to understanding music's meanings, Keil developed an approach that could be termed 'pragmatic'.

Pragmatics has been described as 'the relation of signs to their users and interpreters' (Huang, 2007, 2). Thus, its emphasis is on an understanding of meaning framed within the way in which ordinary language is used *in context*. Although he did not use this term himself, Keil was concerned to move the meanings of music towards the act of music making – how it actually occurs between people and in this way 'pragmatic' becomes a useful shorthand for how his ideas contrast with the syntactic, semantic notions above.

Participatory discrepancies – Keil's theory of musical pragmatics

The core of Keil's position is summarised by his well known thesis of 'participatory discrepancies' which lays out a distinctive view of how music is meaningful (Keil, 1995; Keil & Feld, 1994). It may best be described as an attempt to re-focus the understanding of music towards a set of interactions rather than structures. Music comes to mean through the sounded negotiations of participants, through 'getting in the groove' and other interactions at many levels and so Keil's concern, as with other 'groovologists' is with music as it is actually performed rather than as it appears within a score (Alen, 1995; Progler, 1995). Participatory discrepancies (PDs) are described along two axes, textural and processual. The textural refers to aspects of tone and timbre, and processual to the motional aspects of music. The motional aspect could be seen as the groove or swing in jazz but more broadly could be thought of as pulse or energy within the music. It is something in the grain, or weft of the music – established through the micro-tonal, micro-timed shifts of the participants and it is the combination of these elements that is the most engaging aspect of musical performance for Keil. Steven Feld speaks of something similar when he writes that groove encodes 'an unspecifiable but ordered sense of something…working to draw a listener in' (Feld, 1994a, 112).

Music as liberation – Keil and Adorno

There have been numerous examinations of meaning in popular music which, in contrast to Meyer, tend to assert, that musical meaning is not inherent in the sonic text. Within socio-cultural studies of music, for instance, music's meanings have been examined as though the sounds themselves are of little consequence compared to the social relationships of those who engage with them (Hebdige, 1979). Keil is looking to assert the meanings of popular music in a rather different way. From his perspective, the 'social' (which is captured by his use of the word 'participation') becomes much more integrated into the musical fabric itself and yet Keil resists the problems of intrinsic meaning through his vision of musical meaning 'as use'. In bringing ideas of 'participation' and 'discrepancy' together, Keil appears to be offering a way out of the 'meaning as intrinsic versus meaning as extrinsic' problem (Shepherd & Wicke, 1997). Keil's work also interestingly offers, in my view, an alternative to Adorno's position on popular music as little more than standardised, repetitive formulas lacking cultural resistance (Adorno, 1989). Keil and Adorno may not be obvious choices for comparison but it seems noteworthy that they both offer music as some form of liberation but through such different routes.

Adorno's writings are an unambiguous challenge to capitalist ideology; this takes shape in his consciously difficult prose and his view that only in the defiant form of art music could this ideology be exposed. Popular music, on the other hand, was seen by Adorno as passive, only able to affirm and collude with the totally organised society. Whereas Adorno sees a counter to the dominant ideology in the alienating forms of, for example, Schoenberg, Keil looks to the imperfections inherent in musical performance as a counter to the industrial perfectability of much music-making, an aesthetic position that embraces a challenge to social

structures, not through *form* but through the messiness of human *agency*. It is in the shared discrepancies of grooving and music-making that Keil sees music's powers.

Participatory discrepancies and groove

The paradox in talking of 'discrepancies' as the source of groove's power is that many musicians' discourse on groove involves quite the reverse. Musicians use vocabulary that implies togetherness and cohesion rather than discrepancy. While jazz musicians recognise that groove is not about machine-like precision, there is a strong sense that playing well together exhibits an element of stability and sameness that Keil's use of the word 'discrepancy' does not immediately suggest. Of course, describing musical timing as together or apart depends on the level of analysis (that is, whether one is looking at quarter notes or milliseconds) and Keil, in his use of the term 'discrepancy', is making a cultural-political statement against the idea of music as a perfectable object; as he says, 'Music to be personally involving and socially valuable, must be 'out of time' and 'out of tune' [but] 'out of time' and 'out of tune' only in relation to music department standardization and the civilised worldview' (Keil, 1995, 4).

Keil's proposal for a theory of PDs emerged over a period when the analytical mechanisms for examining micro-timing were still being refined. Kvifte (2004) has argued that many of the assumptions of Keil's distinctions between syntax and process need a more nuanced approach when looking at groove. In addition to his questioning the validity of the separation between process and syntax that Keil makes, he has some insightful comments about the problems of analysis that rear up within the study of temporality, particularly in terms of clarifying the object of

study. Kvifte asks what precisely is being measured in some of the PD-inspired studies of groove measurement (Alen, 1995; Progler, 1995). Borrowing from Bengtsson's concept of SYVAR, an approach to measuring expressive sounds in music, Kvifte discriminates between the notated events, the physically sounded onsets and the beat as experienced, and points to the need to be clear about which of these are being compared when looking at PD's. In sum, Kvifte is making the point 'what do we mean exactly when we talk about beat?' In doing so, he addresses complex issues of methodology which have been rather skated over by the 'groovologists'.

While Kvifte's criticisms of the rather loose methodology and terminology used by the 'groovers' are valid, it may be rather to miss the point of Keil's work. The strength of Keil's contribution to our understanding of musical meaning is his setting up an overall framework for analysis and the rhetoric in Keil's work was an attempt to stimulate a debate about what is important when we look at music-making and to that extent, Keil's work can be seen as successful. Keil's writing works as a hymn of praise to imperfection rather than an objective analysis of the relationship between musical grammar and performance. This is the hook on which he hangs his passionate attack on the hegemony of art music and its analysis.

Keil has made the point that music is not about some essence 'that we can simply take for granted, but must be figured out each time between players...it's about getting down and into the groove, everyone creating socially from the bottom up' (Keil, 1995, 1). What remains slightly perplexing in Keil's work is that although he writes about 'creating socially', in the main, Keil makes only the broadest gestures towards understanding the ways in which musical and social relations are interlinked. It is in the writing of Monson that this relationship is fully specified.

2.4 Metapragmatics

The last part of this chapter takes a final linguistic turn, characterised as 'metapragmatics', and at this point, I return to the work of Ingrid Monson and go into more detail about her analysis of jazz interaction. I characterised Keil's understanding of meaning as a 'pragmatic' one, through his attempt to understand musical meaning as it is acted out by participants; Monson (1996) develops an analysis of musical meaning that is 'metapragmatic', a term from the socio-linguistics of Silverstein (1997). Distinct from pragmatics which understands meaning as a function of usage, metapragmatics is concerned with the contextualising and recontextualising of cultural forms.

Monson's metapragmatic account of jazz interaction highlights the way that meaning for musicians is necessarily a social product. She has taken 'talk' rather than 'grammar' as the template to understand how jazz musicians develop their cultural identity and establish socio-musical relationships and her approach has done much to theorise the interactive, social nature of musical meaning.

Monson's place within jazz ethnography

Monson is one of a group of writers to focus on jazz performance from a largely ethnographic stance. Over the last forty years, there has been a steady output of work devoted to the understanding of the jazz world and the way in which lives on and off the bandstand come to be part of 'sayin' something' musically (Jackson, 1998; Jones, 1970; Williams, 1983; Wilmer, 1977).

Closest to Monson's approach is Paul Berliner's work (1994), the most comprehensive ethnography of the jazz life that has been undertaken. His examination has been termed panoramic and indeed it takes the reader through

the long journey that musicians make into the world of jazz performance. It has been criticised (Reinholdsson, 1998, 33) for its concentration on ethnography from a particular era, the 1950s, and this same criticism could be extended to its geographical focus towards the scenes within the large American cities. This does not appear to me to present a serious objection. *That* time and *those* places present perhaps the greatest concentration of jazz musicians and so it seems reasonable to study a music world from this perspective – it is also logical methodologically to work from a place where participants are in the greatest number. As a work of description, Berliner's account may be unparalleled but in comparison with Monson's work, it lacks a theoretical spine. The jazz life is understood purely on its own terms and while this has been seen as its strength – the author letting the participants frame their experiences free from a layer of interpretation – the reader would have benefited from greater insight into the socio-cultural forces which underpinned individual musicians' accounts of their working lives.

What distinguishes Monson's work most from Berliner's is the conceptual integration of the broad cultural context within which American jazz musicians lead their lives with the momentary interactions between players that make up jazz performance. It is also one of the few monographs about jazz that places the role of the accompanist in a more central position. In Monson's own words, her work focuses on the 'implications musician's observations about musical processes may have for the rethinking of musical analysis and cultural interpretation from an interactive point of view...' (Monson, 1996, 5).

Monson's view of music and language

The themes which Monson explores emerge from the relationship between language and music, a relationship which is set out by many of the participants in her research. Her work therefore raises important issues about how music is theorised and talked about just as much as it gives insight into the nature of performance. Nicholas Cook has proposed that a musical culture is 'a repertoire of means for imagining music' and that it is 'the specific pattern of divergences between the experience of music on the one hand , and the images by means of which it is represented on the other that gives a musical culture its identity' (Cook, 1990, 4). For Monson, the informal 'music as talk' metaphors that her participants use become 'pathways into a deeper understanding of the relationship between musical practice and cultural meaning' (Monson,1996, 73). For both writers, whether discussing Schenkerian analysis or the argot of New York jazz, there is a concern for what 'doing' and 'saying' bring to the table. However, there are clear differences in the focus of their work. Cook is demonstrating where and how perceptual process ends and the imaginative rationality of theory begins whereas Monson is concerned with performance as a reflection of broader social realities. Cook interprets musical culture as a *divergence* between musical experience and the theoretical imagining of that experience whereas Monson sees an unambiguous homology between conversation and jazz interaction, musical culture seen as a *convergence* between musical sounds and words.

Monson's development of the idea that improvisation shares things with conversation also attempts something quite different to Cook, in that it sets up musical meaning within an explicitly social framework; her interest lies in how music 'functions in a relational or discursive rather than an absolute manner.' (Monson, 1996, 97). The values and sensibilities of the Afro-American community

are seen as having a direct relationship to conduct on the bandstand and it is particularly through the metaphors of language that this conduct is most clearly expressed.

Jazz talk and the diaspora

Related to the work of this project is the question of how Monson's analysis can be made to work within the jazz diaspora. The term 'diaspora' in musicology has been investigated as the tracing of musical origins (Jackson, 2000), the global spread of musical styles and the consciousness of separation that accompanies that spread (Slobin, 2003). In jazz, it denotes a double separation, firstly in its more profound sense as the forced separation of Africans from their homeland but secondly in the way in which jazz has separated out from its American beginnings to become this melange of styles. The word speaks also of the relationship that non-American musicians enjoy with the music's geographic and cultural roots. Can Monson's account of this framework of Afro-American musical/linguistic interaction make any sense for improvised music outside that community? Many, if not all, the musical interactions that Monson describes (such as quoting, responding, being ironic) appear to be musical features common to jazz performance in Europe and elsewhere. This does not deny Monson's thesis but does raise intriguing questions about what musicians within different communities make of these musical practices, divorced from the cultural ground from which they appeared. How are the cultural meanings derived from music and social context re-shaped as the music travels? If Europeans readily use musical practices such as quoting or responding in the same way as African-Americans, it could mean that the parallels between conversation and improvisation that Monson describes as giving black

American identity a particular coherence are generalisable beyond this specific cultural context.

Groove within metapragmatics

Within her examination of how interaction takes place, Monson sees groove as an aesthetic ideal. She recognises the tensions that exist between the desire for self expression and the need to work for the group and understands how these tensions are expressed differently according to role. The relationship of the soloist to rhythm section can often undermine the assertion that jazz is essentially democratic.

Monson does not pursue the metaphor of conversation in her examination of groove in the way that she does for the broader interactions between musicians such as turn-taking or quoting; this highlights the way in which groove is less compatible with speech than the larger scale musical negotiations between players. Rather, she picks up on the metaphors of sociable feeling that musicians frequently use, such as being 'arm-in-arm' or 'walking down the street' (1996, 68). But being in the groove, while it certainly involves sociability is much more about coherence at the bodily, motional level. Fingers, arms and legs all need to work in concert together before the aesthetic ideal can be realised and later in this study, I examine the ways in which such embodied moves may themselves become a source for sociability.

2.5 Summary

In this chapter, I have looked at various ways in which musical meaning has been explored. The theme of the chapter expressed the important analogy with language that much music research makes use of in its explaining musical meaning/feeling. Through the chapter, the sense of meaning/feeling has developed from being a rather mechanistic relationship between sound and listener, to meaning/feeling occurring via the meshing of the syntactic relations within a work and the musical expectancies of the listener, and finally to the idea that meaning/feeling arises through what musicians do rather than what music does. In Chapter 3, I build on this sort of approach in the work of Monson and Keil by acknowledging that to make sense of jazz and groove we need to comprehend how it occurs dynamically between people. Both of these writers emphasise this facet of groove – for Keil, it is the dialectic of individual and group expressed in the idea of participatory discrepancies and for Monson, groove forms part of the frame for the interactional conversation that is jazz. However, I think that both of these writers leave much unspecified about the dynamic 'between-ness' of groove and how it comes about. What are the mechanisms through which being together in time becomes such a powerful feeling for jazz musicians? In the next chapter, I begin to account for the dynamic sharedness of groove by exploring intersubjectivity and its grounding within entrained motion.

3 Musical motion, intersubjectivity and entrainment

The previous chapter examined the various ways in which researchers have defined musical meaning in terms of qualities that are analogous to features of language. In Chapter 3, I look to the idea of intersubjectivity as a means of marshalling a range of ideas on embodiment and motion that begin to explain the foundations of groove. This form of intersubjectivity is one that understands the intersubjective as an elemental, pre-linguistic opening out onto the world, an understanding that arises particularly in the work of phenomenologists during the last century.

Through this examination of the intersubjective, I begin to develop an understanding of musical experience that invokes intersubjectivity not as an abstract philosophical concept, but as a quality that is grounded in the embodied moves of musicians; a motional, naturalised account. In naturalising intersubjectivity, I make use of the concept of entrainment, a model of rhythmic engagement between autonomous bodies that may emerge under particular conditions such as music-making. In this way, I hope to offer a distinctive view of the conditions through which music-making and the temporal aspects of music become meaningful for participants.

Before looking at intersubjectivity and its embodied expression as entrainment, I want first to examine a necessary constituent of entrained behaviour – motion.

3.1 Music and motion

The relationship between music and motion appears inseparable. It is also complex. Musical performance is embedded in movements of the body which contribute towards meaningful performance (Clarke & Davidson, 1998; Clayton, 2005; Davidson, 1993; Davidson, 2001; Williamon & Davidson, 2002). This contribution is not simply made up from the movements necessary to create sound but also from the para-musical signals designed for the audience and other musicians (Clayton, 2007b). This extra tranche of moves may not have a direct bearing on sound production but clearly seems to be integral to performance; such moves include the swaying of the body and nodding of the head as well as less periodic, often idiosyncratic movements. Not all of these moves are necessarily gestural in the vernacular sense but can be highly communicative.

Counter-balancing the idea of motion as integral to the production of a performance, there is a perceptual and responsive dimension to musical motion. As well as its being a consequence of motion, music itself produces motional consequences for participants – most obviously, the responsive behaviour of audiences. There are also a range of motional percepts that includes feelings of self-motion (even without displayed movement), and the perceived movement in musical sounds, a sense which may be aroused by features such as tempo conditions, musical form, harmonic change (Todd, 1999). As Clarke has made clear, music has the ability to set up feelings of movement without it always being clear who or what is moving (2001). This uncertainty about the precise provenance of musical motion has led to rather different conclusions about its nature. The links between bodily movement and music seem obvious but a rather strange feature of much music research is the rather disembodied approach to musical motion as commented on by Shove and Repp (1995),

'Traditionally, to explain the source of musical motion, theorists, philosophers and psychologists alike have turned to musical structure, which by most accounts is abstract. This has led some to believe that the motion heard is virtual, illusory or abstract…' (cited in Clarke, 2001, 214).

Metaphoric motion

There has been no clear consensus about the nature of this motional quality except that our understanding of musical experience, at least in different forms of Western music, seems in some way bound up with a sense of its movement. The direction of thought amongst aestheticians and philosophers has generally been to explore musical motion as belonging to a symbolic realm. For Scruton (1997), there are a number of key elements in defining the nature of musical experience which lead to his seeing it as an essentially metaphoric one, with motion and space being prime within that metaphoric experience. By this he means that our experience of music is analogous to our experience of metaphor – both involve a double engagement or as he describes it, both have 'double intentionality'. Scruton makes the point that music's very nature is different from that of the world of sound and while it enjoys a material basis in sound, our engagement with music is incommensurable with our engagement with the sounds of the world. As soon as we begin to hear sounds as music, they then cease to be material sounds and become intentional objects; in other words, hearing sounds as music involves bringing a sort of imaginative rationality to the experience.

Scruton's analysis of motion and space within music as essentially metaphoric constructions raises a number of difficult points. As Cumming remarks, Scruton's claim about music belonging to the intentional rather than material world makes its

ontological status rather unclear (1994). Firstly, he argues for a view of music's autonomy as a unique kind of object, separated from worldly, material sound but at the same time, he pursues the line that music can only really be explained as a metaphoric construction. If this is the case, then it would seem to lose its claims to autonomy in that it can never be understood on its own terms. Secondly, he makes a distinction between figurative and literal engagement with the world that, in the light of recent research into metaphor appears to be a less well-defined boundary (Johnson, 1987; Kovecses, 2002; Lakoff, 1999; Lakoff & Johnson, 1980). Cumming argues that Scruton's distinction between figurative and literal language lacks an acknowledgement of the permeability between the two (1994). For Clarke, it is the separation between sound and tone that is not convincing,

> 'The sounds of music can and obviously do specify objects and events in the world (instruments and the people who play them), and kinds of action, even when the nature of what is acting is unclear or uncertain' (2001, 217).

So if the tones of music and the sounds of the world are much more intertwined than Scruton acknowledges, what is the nature of this intertwining?

Virtual motion

In contrast to Scruton, Clarke argues for a sense of movement that is derived from a perceptual and not a solely imaginative engagement with music and in so doing returns music to the sounds of the world. In drawing on ecological principles of perception, Clarke ascribes ideas of motion to a virtual rather than metaphoric realm. The idea of the virtual may appear at first to be more or less the same as the idea of metaphor but there is considerable difference. This can be explained

through an ecological viewpoint which argues that humans derive considerable meaning from the world in a direct, unmediated way.

The idea of ecological perception was developed by James Gibson as a radical response to the contemporary dominant model of cognitivism (1986). Within cognitivism, it has been understood that behaviours cannot be cut off from knowledge; cognitive psychology proposed that humans process stimulus inputs and create rule based structures for interpreting stimuli and planning future actions (Fodor, 1975; Miller, Galanter, & Pribram, 1960). In classical cognitivism, '...cognition came to be viewed as the formation and use of representations according to rule' (Reed, 1991). Gibson rejected this notion that meaning emerges out of successively higher mental processes, founded upon primitive perceptions from which we 'build' an internal model of the world. Instead, he proposed a revolutionary approach to perception by suggesting that much of what is meaningful for us in the world is already highly specified by our continual interaction with information sources in the environment.

So while classical accounts of cognition are essentially disembodied, Gibson proposed that our cognitive capacities emerge in a more holistic, bodily manner. Our senses are constantly tuning in to the environment in order for us to interact with that environment (be that cultural or natural). Actions and perceptions continually re-invigorate one another, offering new possibilities for learning and change as we move through the world. This continual interaction between self and environment is propelled by the notion of *affordance,* that is the gearing of our perceptual apparatus to the opportunities that the environment may provide; such opportunities are relational – an affordance is the accommodation between the needs of the organism and its being sated through what the environment provides.

This is by necessity an extremely condensed look at ecological perception but it does provide a view of meaning which is tightly tied to action and perception and offers another way to understanding motion in music (Clarke, 2005). As will be shown in section 3.3.1, ecological perception also informs current thinking on general attentional processes which underpin musical perception (Jones & Boltz, 1989).

How do these principles help in understanding musical motion? Clarke's account seems to have advantages over the 'metaphoric' account of musical meaning that Scruton offers. Firstly, it can take musical sound to be an aspect of sound in the world, rather than having a fundamentally different character to non-musical sound. The separation of sound and tone which Scruton insists upon as a condition for understanding human engagement with music appears to underestimate the degree of connection between music and worldly sound. By referring to the sense of motion as virtual, Clarke is proposing that musical motion is perceptually real – musical sounds are perceptually organised in the same way as any other sounds but he also suggests that it works mimetically. In the same way that pigment on a canvas mimics the properties of ambient light but does not contain its reflective properties, so the sense of space and motion in music is characteristically 'real' but is an artifact. Clarke gives the example of change in timbre and texture within the opening of a Fatboy Slim dance track as follows,

> 'The perceptual effect of the 34-second section described here...is of a continuous movement towards a sound source...It is not clear whether this specifies self-motion towards a stationary sound source, or a moving sound source that approaches a stationary listening point – but in either case there is a powerful sense of the source being at first concealed below some kind

> of acoustic horizon, above which it then progressively rises until it is fully revealed…' (2005, 81).

Beyond understanding the sense of motion that we experience in musical sound from a listener's perspective, this form of ecological approach may also help to tie in the various forms of motion that come together in performance. Sounds specify movements and vice versa and the complete experience of watching and listening to movement both actual and virtual must surely have a unifying effect on the experience of music and musicians being in motion.

Motion and groove

From ideas of motion as being metaphorical or virtual, I move to the ways in which musical motion, as part of groove, is quite real. Many commentators have defined the presence of groove by the tendency of participants to nod their heads or tap their feet (Iyer, 2002; Keil & Feld, 1994; Pressing, 2002; Progler, 1995). Such movements have been described as 'batons' in speech-accompanying gesture (Efron, 1941; cited in McNeill, 2005, 40), part of a suite of supporting movements that are not communicative or productive in the usual sense but seem to assist in the intensification of feeling. In comparison with the bulk of movement analysis in music performance, these pulse-like movements have received only little attention (Eldson, 2006) but it is clear that such movements form an important part of the experience of groove for some players (Berliner, 1994; Keil & Feld, 1994; Monson, 1997). Such movements also point to the entrainment between players during groove and this will be dealt with in some detail in section 8.4.

Summarising motion

Writers such as Scruton and Clarke have separately identified the significance of movement and sense of motion in music but from the perspective of listeners. From the viewpoint of musicians, the motional engagement with sounds is also thoroughly grounded in real movements such as tapping feet or nodding heads as musicians play in time together. Although playing musical time requires a complex set of capacities on the part of the musicians, to be able to groove requires more than just individual temporal abilities. Groove requires the capacity to share this common ground of timekeeping with others and our human ability to share such common ground is captured by the term, intersubjectivity.

In this next section, I develop an argument that firstly examines intersubjective relations and then seeks to 'naturalise' these relations through the mechanism of entrainment. But first, what is meant by intersubjectivity?

3.2 Intersubjectivity

The nature of human sociality is expressed through a number of common themes within the social sciences. These themes consider our social being in terms of an understanding of self, empathic awareness, and alterity. This cluster can be understood within a single term, that of *intersubjectivity.*

Intersubjectivity as a concept is multi-layered and a number of distinct theoretical approaches have been advanced to explain its nature. It has been described as a property which 'opens up the middle ground' between subjective experience and objective existence' (Edgar & Sedgwick, 2002, 197) and as such it is a useful

concept for making sense of cultural significance for agents with its implicit problematising of how subjective and objective properties co-exist, but this seems an insufficient definition. In its weakest sense, the term can be used to convey this validation of the external world through shared experience but stronger theories of intersubjectivity as discussed below go further than this. These stronger intersubjective approaches to the self and social world have all understood intersubjectivity as an attempt to interpret the self in terms that go beyond the objective/subjective dichotomy (Depraz & Cosmelli, 2003). The 'I – Thou' or second-person centred approach rejects the polarity of first and third-person approaches (subjective and objective stances) and replaces these with a fundamentally relational understanding of the self as 'a plastic spectrum of interactions' (ibid, 165).

Much of the intersubjective literature is associated with the work of theorists such as Habermas who in their analysis of the lifeworld and the nature of communicative action have put the intersubjective at the centre of their politically engaged work (Habermas, 1984; Habermas, 1998). My interest in this chapter however is directed towards phenomenological approaches.

Within phenomenology, different understandings of intersubjectivity have revolved around the degree to which it can be seen as the foundation of human subjectivity itself; that is, the ways in which our experience of self is irreducibly social and relational. In music-making, intersubjectivity captures the idea that not only meanings but the immediate experience of music making is generated through the sharedness of action, knowledge and belonging. In the remainder of this chapter, I explore this communion and how it is relevant to music.

Egological intersubjectivity

Face-to-face intersubjectivity can be characterised by two phenomenological approaches. These have been termed egological and radical accounts of the intersubjective; the egological account, associated with Husserl, can be seen as a more self-knowing, self-aware engagement with others whereas radical intersubjectivity interprets our understanding of self and others through a foundational, pre-reflexive engagement with others. These are not necessarily competing accounts in that they are both required for a full understanding of the shared world. Rather, it is the case that different authors have paid attention to one or the other of these forms of intersubjective relations or sometimes both.

Egological approaches to intersubjectivity begin with the work of Husserl whose understanding of the bases of human consciousness included investigations of both intersubjectivity and temporality. For Husserl, the question of intersubjective relations – how self and other are constituted – is an attempt to resolve the potential problem of his work on consciousness as an essentially solipsistic exercise. The intersubjective remained a consistently difficult problem for Husserl through his life. The 'other' is not given to consciousness in the same way as objects are. It is not possible to, for example, feel the pain of another directly or experience the way in which another hears music; rather, one can feel the experience of another through indirect means. The way in to another's experience is through a form of empathy, 'a non-primordial experience which reveals a primordial experience' (Moran, 2000, 176). The attempt by Husserl in his 'Cartesian Mediations' to account for the experience of other consciousnesses is founded on the idea of analogical transfer – that through the behaviour of others, we can infer that they too must be conscious subjects by actions that resemble our own. The general objection to this is the way in which the experience of others

must always be reduced to the solitary consciousness of the subject; intersubjective relations are conceived in Husserl's vision as the sum of individual consciousnesses created through 'an imaginative, analogical process' (Crossley, 1996, 7) and so the intersubjective world in Husserl's account remains founded on subjective experience.

In an updated form, Husserl's vision of an egological intersubjectivity in which we experience others through an imaginative transposition of self shares some points of contact with what cognitive science refers to as 'theory of mind' (Homer & Tamis-LeMonda, 2005; Luciarello et al., 2004). Work on 'theory of mind' forms a crucial segment of current work on consciousness and attempts to explain much of our social cognitive capacity in terms of being able to represent (theorise) the intentions and beliefs of others in much the same way as a scientist may frame his/her understanding of some aspect of the world. The 'theoretical' in theory of mind is the sense in which theorising allows for prediction and thus some stability in our dealing with others. Theory of mind is an ability to account for the motivations and desires of others without our being able to actually verify the contents of their mind; in this sense, theory of mind is a folk psychology.

Playing music with another would seem to require us to have some interest in the minds of others, in fact there seems little fundamental point to playing music except to so engage. From the perspective of musicians grooving on a stage, however, the theory of mind seems a rather abstract, *dis*engaged account of how we engage.

Radical intersubjectivity

In contrast to theory of mind and the more egological approaches to the intersubjective world, there are other approaches to the problem of engaging with others which deny the need for our theorising or analogising in order to gain access to others. Gordon (1996) has offered an account of our understanding others which is an altogether more holistic, affective account of the human capacity to get into the minds of consociates. While it is the case that adults seem to have some considerable capacity for theorising about the states of mind of others, radical intersubjectivity offers an account of human intentionality without the need for an overt intellectualising that appears key to much of 'theory of mind' theory (Zahavi, 2005).

In this radical form, intersubjectivity is seen as going beyond our empathising with or understanding others through analogy or theorising about their state of mind. Instead, it can be characterised as a pre-reflexive, constituting of the world and others. With regard to timing between musicians, this radical sense of the intersubjective appears to correspond to the most fundamental way in which musicians just play together with no thought of the quality or craft involved. This is the simplest temporal involvement that we can imagine, whether a baby clapping with its mother (music-making in the broadest sense) or two teenagers strumming a chord together on guitars. At the same time, this engagement also speaks of what is most powerful about playing together, their moving towards an unreflective musical engagement with others that many musicians may cite as the peak experience of playing. I believe this corresponds closely to Schutz's famous formulation of the phenomenological basis of the social world as a 'mutual tuning-in' (Schutz, 1964; Schutz, 1967) but also speaks of Heidegger's famous description of a carpenter's use of the hammer which in the moment is an entirely

pragmatic rather than theoretical or conceptual experience (Gallagher, 2001). These views resonate with the picture of a musician at work in the groove.

A number of philosophers have put forward a view of human experience as founded on a radical second-person experience of the world. The theologian, Martin Buber, problematised the social dimensions of man by distinguishing between the 'social' and the 'interhuman' (Buber, 1992). Buber thus sought to understand empathic, one–to-one relations as being of a different order to collective social life. In his typically poetic writings, Buber speaks of the intersubjective as 'On the far side of the subjective, on this side of the objective, on the narrow ridge, where *I* and *Thou* meet, there is the realm of "between" ' (ibid, 40). The 'social' and 'interhuman' dimensions correspond to the I-It and I-Thou relations that mark much of Buber's religious writing (Buber, 1958). Buber's contribution to an understanding of intersubjectivity, while written from a theological standpoint nevertheless articulates a view, consistent with some phenomenologists, that the relational nature of self and other is woven into our sense of self at the most fundamental level.

A more radical approach still emerges from the writings of Maurice Merleau-Ponty. Much of Merleau-Ponty's thought on the intersubjective builds on Husserl's work in that both ask questions of how our lives can be so shared when our consciousness of the world is by definition internal but his conclusions are very different. Merleau-Ponty's sense of the intersubjective world is much more concerned with the perceptual dimensions of consciousness and the corporeality of perception. Merleau-Ponty rejected the view that perception is the effect of a physical stimulus on the sense organ (empiricism) and its opposite, that perception is an act of consciousness (intellectualism) (Crossley, 1996). Instead, he regarded the experience of our senses as a 'communication with the world' (1962, 61) and

perception as a *relationship* between the subject and the world. In this respect, Merleau-Ponty's views pre-figure the ecological claims of James Gibson. For both writers, the subject/object dichotomy is replaced by an understanding that perception is an active engagement. As Crossley points out, perceptual consciousness is in the first instance 'a practical consciousness and as such it is pre-reflective, pre-objective' (1996, 27).

Merleau-Ponty's claims about our engagement with the world of objects and other subjects also calls to mind the way in which musicians are absorbed in the immediacy of playing with others. Musicians act and respond to one another much of the time in a largely unreflective way. Research within developmental psychology suggests that this being in time with others has its grounding in the very beginnings of infancy and studies over the last twenty years suggest an innate disposition in humankind to engage with others in this primary, non-mediated form.

Developmental origins of intersubjectivity

From a developmental viewpoint and one that chimes with the radical version of intersubjectivity posited by Merleau-Ponty, Buber and others, Bermudez has argued for a conception of self-other awareness that is pre-linguistic and non-conceptual; he looks to a description of awareness that is 'logically and ontogenetically more primitive than the higher forms of self-consciousness that are usually the focus of philosophical debate' (Bermudez, 1998). This challenges the view held by 'theory of mind' theorists that infants lack understanding of self and other until they reach an age of about four years. This view of self-awareness not predicated on linguistic reference is echoed by other developmental psychologists,

such as Stern, who whilst conceding that an infant's view of self may be primitive compared to an adult, argued for self-experience at a much earlier age (1985). In a not dissimilar way, Neisser has developed a non-representational view of the self in terms of an ecological and interpersonal self (1993).

Developmental psychology has been interested not only in self-awareness but also the communicative capacities of the self that are necessary for participation in the lifeworld. Research over the last forty years has developed a consensus about the capacity of infants for communication and engagement. Whereas earlier work by figures such as Piaget (1961) had suggested a rather closed view of early infancy, a state that could be described as remote from the world, recent research shows very much the opposite tendency (Meltzoff & Moore, 1991; Stern, 1977). Far from being unwilling participants who need to be initiated into the social world, a view emerges of infants looking out towards their carers and their world from the moment of birth.

The attunement between infants and caregivers in the first few months of a baby's life has been described as a 'communicative musicality' (Malloch, 1999/2000). The rhythmic and melodic contours of such interactions form a narrative of companionship between parent and infant; this communicative musicality is embodied - that is, it finds expression through a mutually constituted relationship, whether that be vocal, gestural or tactile. The 'musicality' that Malloch refers to in parent-infant interaction is part of the vocabulary that a number of researchers have developed to account for the bases of human communicative processes. By using the term 'musicality' with regard to infants, such developmental research suggests that infant behaviour needs to be seen as a much more active engagement with the world, an engagement that is endlessly communicative and sociable; hence the child participates in its own formation (Crossley, 1996).

Trevarthen has argued that musical proficiency in children can be traced directly back to the innate impulses that motivate infants' communicative contributions to the parent-infant dyad (Trevarthen, 1980; Trevarthen, 1999-2000). Citing Dissanayake (2000), he argues that

> 'The innate communicative talent that shows itself in an infant's playful sharing of 'proto-conversations', songs and action games is what gives vitality and value to cultivated products of music, poetry and dance in their endless complexity and diversity' (Trevarthen, 2002, 25).

For Trevarthen, the importance of 'musicality' lies in its indicating a radical or as he terms it, a *primary* intersubjectivity whence springs the innate desire to communicate with others. Whereas, much research looks to the theory of mind as the means by which humans make inference about the feelings, desires, beliefs of others, for Trevarthen, a theory of mind is epiphenomenal, an unnecessary obstruction to understanding the human empathic world; he bypasses this with an account of sociability and mutuality that is derived from enacted temporal schemas. It is from these pre-reflective, synchronous motives that the beginnings of intersubjectivity and the vitality of musical engagement emerge.

The foundations of Trevarthen's approach lie in the idea of 'motive' which in his usage is taken to have a particular meaning. His use of the word is analogous to the term 'schema' as proposed by Piaget; briefly, motives can be seen as innate motor images which also serve 'for the perception of the "affordance" of the object' (Trevarthen, 1980, 326). Such motives are organised within neuro-anatomical structures such as the limbic system. The suite of systems which integrate the guidance of expression and execution of actions is referred to as the Intrinsic Motive Formation (IMF). The IMF reaches functionality through the Intrinsic Motive Pulse (IMP) which comprises time sense, sensitivity to temporal variation and the

picking up of narrative qualities in human action (that is the sense of development that emerges in action and interaction). In neuronal terms, the idea of an IMP argues for a synchronised, rhythmic foundation for being an agent in the world; the cell assemblies involved in the control of movements and the quality of those movements are intimately coordinated with affective components in the nervous system. When 'musicality' as a human quality is examined through music as an activity, Trevarthen argues that

> 'The pulse and rhythm of music conveys information about the dynamic images behind action of the whole body of a person and its multifarious motor systems acting in concert' (Trevarthen, 1999, 166).

This 'musical' approach to intersubjective relations is thus proposed along two lines: firstly, that our consciousness as directed to the world (intentionality in a Husserlian sense) is crucially regulated by motor images (motives) and secondly, that these motive rhythms are fundamentally communicative. Such rhythms regulate our own internal impulses but they also point outwards to the world of others.

3.3 Entrainment - naturalising intersubjectivity

Bearing in mind these radical perspectives on sharedness, I want to make the case for seeing groove, as a naturalised, embodied form of intersubjectivity. My approach in 'naturalising intersubjectivity' has been influenced by a project linking phenomenological perspectives on consciousness with recent developments in cognitive science – an attempt at a linkage that has been described as 'naturalising phenomenology' (Petitot et al., 1999). I will be arguing that the

primary, radical intersubjectivity mentioned above can be motivated through the embodied mechanisms of entrainment. If we apply these ideas to music, then the entrained behaviours of musicians when grooving together can be viewed as a form of primary musical intersubjectivity. In using entrainment as an explanatory model, I also make the case for the intersubjectivity of groove to have an irreducibly temporal character – entrainment grounds musical interaction in both the intersubjective and the temporal.

The work of Trevarthen and others, discussed in brief above, describes an innate rhythmicity which serves both to organise and communicate. Although Trevarthen is resistant to the notion of entrainment as applying to his own work, it seems to me that in his arguing for an Intrinsic Motive Pulse that synchronises cell assemblies, he is proposing mechanisms that at least allude to something like entrainment as a foundational principle.

Entrainment as a theory of synchronous behaviour emerges out of the theoretical modelling of non-linear dynamic systems. The application of such models has been highly significant in the understanding of complex systems whose behaviours do not follow linear, predictable paths (micro-timing in groove, for instance!); Strogatz summarised non-linearity as the condition in systems where the whole cannot be calculated from the sum of the parts (Strogatz, 2003).

Entrainment comes into being when independent rhythmic systems fall into step with one another. The basic assumptions underlying entrainment are that 1), there must be two or more autonomous rhythmic processes or oscillators and that 2), these oscillators must interact (Clayton, Sager, & Will, 2004). For oscillators to interact, it is required that there is some degree of coupling force between them. In situations where the rhythmicity of the participating oscillators is too disparate, then entrainment probably will not occur.

While entrainment has been defined fairly consistently by different authors as this emergent tendency of independent rhythmic processes to fall into step one with the other (Clayton et al., 2004; Pikovsky, Kurths, & Rosenblum, 2003; Strogatz, 2003), it is also the case that it has been applied as an organising principle across a range of disciplines and at very different levels of analysis. This range includes the study of physiological rhythmic response to the environment such as circadian and ultradian rhythms (Moore, 1990; Gerkema, 2002; both cited in Clayton, Sager & Will, 2004, 6-7), neuronal behaviours in coordinating actions (Ivry & Richardson, 2002), modelling of social interaction as entrained behaviour (McGrath & Kelly, 1986) and theories of attentional processes (Jones, 2004; Jones & Boltz, 1989).

3.3.1 Musical entrainment

Although entrainment principles have been used to model wide varieties of synchronous behaviour (Pikovsky et al., 2003; Strogatz, 2003) and the understanding of such processes go back to van Huygens in the later part of the seventeenth century, the application of these models to processes involved in musical interaction have remained sparse. Recent attempts to apply entrainment to music have focused on a number of different processes; within a cognitive framework, entrainment theories have been used to suggest how timing processes may work that will allow for sensorimotor synchronisation in music (Repp, 2000; Repp, 2002a; Repp, 2002b; Thaut, 1998); as mentioned earlier, attentional processes have also been suggested as essentially an entrainment or set of entrainments between ourselves and external events such as musical rhythms (Barnes & Jones, 2000; Jones, 2004; Jones & Skelly, 1993) and the suggestion that such processes may underpin our social engagement has been applied to the way in which musicians coordinate their stage moves (Clayton, 2007a). Thus the

same sorts of processes may be implicated at a sub-personal, at a person-object and interpersonal level. This considerable applicability across domains can make this model attractive as a way of understanding musical communion.

On what basis can entrainment between independent rhythmic processes be assessed? How is this sort of interaction to be measured? There are two significant dimensions which come into play when assessing the relationships between independent systems. These are 1) the **period** of a limit cycle which is the time taken for each oscillator to return to its initial energy state and 2) **phase** which describes a particular point in the cycle. For instance, in a jazz context, the **period** of a regular quarter note bass line known would be understood as the duration of the note before the next note (and so the next period) whereas the **phase** would generally be understood as a point of occurrence within each cycle, typically the onset point of the sound.

When a pair of oscillators are entrained together, then the entrainment between them may be of period, of phase or both; this does not mean however that the rhythmic profile of the oscillators need be identical, only that the rhythmic relationship is consistent. For example, a consistent periodic relationship might involve one oscillator running at twice the frequency of the other and typical periodic relationships will have simple order ratios between them of 1:1, 1:2, 1:3, although more complex relationships are also evident (Clayton, 2007a). However, this consistent periodic relationship does not imply that the oscillators start together, in other words, they may be out of phase (for instance, one oscillator may begin its cycle at the halfway point of the other). While periodic relationships between cycles tend to share the simple integer ratios described above, phase relationships tend to be more fluid and so are frequently cast in terms of phase angles of 0° - 360° to describe this fluidity. A relative phase of 0° would describe

perfect phase alignment between two oscillators whereas 180° would indicate that one of the oscillators began its cycle at the halfway point of the other's cycle. In summary, the period is a description of event frequency and relative phase is a description of coincidence between time points. In looking at temporal coordination between players, relative phase is a useful description of the degree of asynchrony between any pair of players (which would be measured in ms in absolute terms).

In the following sections, I look at the components of our musical capacity and how these may be understood from a dynamical systems perspective.

Entrainment within research on production and perception

The understanding of temporal production has been guided by rather distinct traditions. The first approach is to view the timing of movements arising from the combination of a central timer or timers whose output is then put into action by the motor system; this approach falls broadly within an information processing view of timing. The second perspective is to view timing properties of actions as the emergent properties of a dynamic system – broadly speaking, an entrainment model.

Of the first approach, the work of Wing and Kristofferson (1973) has laid down probably the most influential model. The Wing/Kristofferson model of movement timing proposes that variability in timing reflects the workings of a central timekeeper and the separate implementation of timed movements. It is an open loop model and thus has no mechanism for correcting timing errors; indeed it is therefore not a useful model for explaining synchronised tapping to metronomes (a key experimental paradigm for temporal production) and for this reason,

researchers have extended the original model to include error correction (Mates, 1994; Vorberg & Wing, 1996). The original model does however explain the negative correlation of successive intervals first noted by Stevens over a century ago (1886); this phenomenon can be clearly observed, for instance, in the walking bass lines of the participants in this study. The model has been further extended by other researchers to provide a psychological mechanism for rhythm by proposing separate clocks each able to account for rhythm production at different hierarchical levels (Vorberg & Hambuch, 1984; Wing & Beek, 2002). The model produced by Vorberg and Wing (1996) has attempted to explicitly account for rhythmic timing by combining the two level timer model with higher order representations. It is this idea of abstract representation playing a major role in timing that is most distinct from the non-linear dynamic approach to timing (Krampe, Engbert, & Kleigl, 2002).

From a non-linear dynamic perspective, the emphasis shifts away from representations (be that in the form of clocks or other higher order models) towards the emergent properties of oscillatory processes in the brain and motor system (Haken, 1996; Kelso, 1995). Some studies have pointed towards a dynamicist explanation for areas of timing movement of interest to music research; studies of bi-manual finger tapping have suggested a coupled system of neural oscillators which each control the left and right hand respectively and model the tempo-induced phase transitions from anti-phase to in-phase in finger taps (Yamanishi, Kawato, & Suzuki, 1980), and Peper, Beek and van Wieringen have examined the bi-manual polyrhythmic patterns theorised in terms of a dynamic system (1995).

To characterise representational models and non-linear systems as an 'either-or' in accounting for movement timing may not be the way forward to greater

understanding of these processes (McAuley & Jones, 2003). As Krampe et al points out (2002), while

> 'representational models have for too long abstracted from the critical contribution of processes and structures in the motor system...at the same time, it seems questionable whether physical reductionism will be successful in accounting for performance in tasks...that individuals manage to deliberately control, like in music performance' (ibid, 3).

This suggests that a greater accommodation need be found between automatic processes and processes that result from conscious use of rhythms and musical patterns.

The other side of the perception/production 'coin' is our ability to keep track of events in the world. One of the puzzles for psychologists is the means by which we are able to focus on environmental features which are flexible and dynamic (Large & Jones, 1999). Although there are relatively constant temporal features within music performance, there are also usually quite seismic sonic changes in the course of jazz, classical or rock 'n' roll piece – changes of tempo, time signature, stops and starts and so on. In addition to these forms of overt change, there are the asynchrony and an-isochrony at micro-levels that are built into the expressive weave of musical play. These different levels of changeability within an overall framework require a human apparatus that is at once sensitive to different levels of change and at the same time doesn't lose track of the bigger picture.

The notion of attention, our ability to focus on particular aspects of our immediate environment has been of interest to psychologists since the 19th century. William James expressed attention as 'the taking possession of the mind, in clear and vivid form, of one out of what may seem several simultaneously possible objects

or trains of thoughts...it implies withdrawal from some things in order to deal effectively with others' (1890, 403).

Contemporary approaches to attending have taken their cue from the work of Gibson (1986). As noted earlier, Gibson's ecological theory of perception maintains that the environment is picked up on by the organism in a very interactive manner. It proposes a continual negotiation between agents and their world as a basis for understanding and action. The work of Mari Riess Jones has developed out of such an ecological understanding of events in the world and views our attentional mechanism as a system that tunes in to temporal events (Jones, 2004; Jones & Boltz, 1989). Their work contends that organisms interact with events

> 'through the common medium of time. Rhythmic organisms interact, more or less effectively, with dynamic flow patterns of events via *entrainment.* An event's driving rhythm shapes an organism's driven rhythm through adaptations of period and phase. This entrainment process extends to rhythms that reflect the ebb and flow of attending energy' (Jones, 2004, 50; italics in original).

London (2004) has integrated this recent work in dynamic attending (Jones, 1992; Jones, 2004) with the generative theories of Lerdahl and Jackendoff (1983) to develop a theory of musical metre. His work encourages this more active, perceptual view of our understanding of metre so that it can be seen as something we contribute to musical experience rather than receive. The attraction of such an approach is the way in which it has solved the traditional problems of viewing metre as an idealised set of integers and instead sees it as a perceptual mechanism, one that is not thrown by the inconsistency of timing inherent in

performance (Gasser, Eck, & Port, 1999). These recent understandings of metre as an attentional process chime with the move away from viewing 'a living system...as a more or less passive receptacle of environmental information' to viewing it as displaying 'a participatory quality supported by an internal energy source which allows for the possibility of active energy exchanges with the surrounding environment' (Jones, 2004,49). Making use of the entrainment principles referred to above, one can thus see metre as the interaction between temporal events (beating drums, footsteps, a choir, a clock) and the internal dynamic rhythms of an organism (neuronal assemblies involved in action/perception cycles).

The tuning of our perceptions outlined above is not unconstrained however. There are considerable limits on our capacity to metrically entrain. While there are a number of researched thresholds for levels of temporal perception (see London 2004, 27-47 for a comprehensive review of such temporal categories), there is a reduced set that is of particular relevance for coordinated timing between players and these are examined below.

The metrical ground over which most musical engagement takes place appears within the following upper and lower limits; the absolute upper limit for metre corresponds to the psychological present, a span of attention that is typically between 2-4 seconds. Below that at around 1.5–2 seconds, there are two psychological thresholds, firstly, the upper limit on *subjective rhymicisation* (the ability to infer a sense of overall metre from a set of tones) and secondly, the point at which negative synchronisation error becomes positive (as attending switches from an anticipatory mode to one of reaction). At the lower limits for auditory perception, there are also a series of distinct zones for different perceptual

phenomena. Hirsch (1959) was the first to research the limits in the perception of temporal order. Hirsch's findings that such limits are around a threshold of 20-25 ms are of some significance here, given the well documented perceptions of jazz musicians' playing 'in front' or 'behind' one another (Berliner, 1994; Collier, 1996; Doffman, 2005). Below this point, laboratory experiments suggest that the order of pairs of sounds cannot be reliably perceived.

Other significant thresholds lie at around 100 ms and 200-250 ms. Repp identified 100 ms as the lower limit of our ability to synchronise with isochronous auditory event sequences (2003); furthermore, his work in line with other studies, suggests that 200-250 ms is the lower limit for improved tapping synchronisation when given the benefit of subdivisions between target tapping tones. Both of these results confirm the proposed limits set by London for fastest tactus rate (c.250 ms) and smallest subdivision (c.100 ms) (2002).

It is worth mentioning here that some other studies and the experience of jazz musicians suggest that such limits may not always be descriptive of real world performance. Michon comments that 'linguistically and musically meaningful sounds show vastly lower temporal order thresholds than meaningless sounds such as beeps' (2000, 88). In the case of live jazz performance, the ability of bassists, for example, to play quarter notes at tempi of around 400 bpm (Riley, 1997), is around 25% greater than Westergaard's notion of fastest beats (cited in London, 2004, p28) and also takes the shortest duration of rhythmic figures down to about 75 ms (i.e. the subdivision used for the 'skip' beat of the ride cymbal and by other players as they play eighth notes at a tempo of 400 bpm). This would suggest that highly skilled players can maintain the sense of synchrony with one another even as they play below typically cited thresholds.

The remaining temporal range that is relevant to metre and entrainment lies at around 600-800 ms and has special significance with regards to the tactus or beat level of metre. Although listeners can detect a beat at ranges between 200 ms and 2 seconds, Parncutt (1987) established a significant relationship between pulse and this 600-800 ms range. It was found that subjects would most freely tap a spontaneous beat within these bounds and would most likely feel a tactus in patterns at different tempi as lying within this range. Other researchers have referred to this band as the *indifference interval* - the duration that was judged to be not too short or long (Wundt, 1911 cited in London, 2004, 31). Interestingly, this middle level of temporal categorisation could be seen to share some of the features of Rosch's notion of the basic level category, an idea discussed in the following chapter.

As mentioned with reference to very fast jazz tempi, the tactus can be entrained to at a number of hierarchical levels. Musicians often appear to feel the beat on faster numbers at the level of the half measure or even at the level of the measure. The felt tactus as the key rhythmic reference therefore, depending on the tempo, may be switched between metrical levels (the beat, the half beat or the measure) to preserve as close a connection to the 600-800 ms range as possible for the players. While most cognitive understandings of entrainment as a mechanism for engagement will suggest no single neuronal assembly or kHz bandwidth as the key, recent studies seem to further confirm the properties of rhythmic stimuli at around 600-800 ms as offering a particularly strong opportunity for the nervous system to fall into step with external events. Will et al have demonstrated hitherto unseen synchronisation between delta brainwaves and musical stimuli (using drum sounds and metronome clicks) suggesting that this synchronisation forms

'an essential part of the neurophysiological processes underlying time coupling between rhythmic sensory input and motor output' (2007).

The above set of thresholds and constraints on perception and production are important not just for what they may tell us about what musicians can do but also tell us something about the cognitive ground from which musicians *feel* what they do, and therefore make judgements about their playing and the playing of others. As suggested above, when temporal stimuli are within a meaningful context (rather than presented to subjects as random sounds) then it appears that temporal acuity tends to be heightened. We should therefore expect that musicians, listening, watching and being proprioceptively engaged, will have a considerable sensitivity to the expressive push and pull of the performed time in the course of a jazz concert.

Entrainment and groove

When focusing on entrainment processes in relation to an understanding of groove, two points should be borne in mind. Firstly, that complete synchrony, although theoretically possible, is unachievable and secondly may be rather undesirable; research has shown that moderately synchronised social entrainment is experienced more positively than tightly coordinated or uncoordinated engagements (Warner et al 1987, p57 cited in Clayton et al, 2004, 13). This type of empirical observation may tie in with the anecdotal experiences of jazz musicians who often speak of a certain elasticity in the timing between players for the music to work. Some researchers have pointed to this out-of-syncness as being part of the expressive vocabulary of groove music (Iyer, 2002). For Keil also, it is this very quality of 'out of timeness' that sets up musical engagement on a temporal **and** social level (1995). For different sorts of music, the degree to which

the coupling between players is weaker or stronger is built into style; within a jazz setting, there is an understanding that a degree of give and take is necessary for the music to be expressive whereas the requirements of a contemporary dance style are generally more proscribed.

Entrainment has been discussed so far in terms of internal cognitive processes that guide perception and action from which structural coherence may emerge in joint action such as music. In the final part of this chapter, I want to develop the idea of entrainment as a foundational principle for social interaction; in other words, how entrainment principles may contribute not only to our engagement with a musical surface but how such principles may be invoked as musicians take the stage together as socially aware beings.

3.3.2 Entrainment as social process

Accounts of temporal perception and production which use entrainment principles do not appear so far removed from the modelling of complex mechanical systems; the nervous system, banks of cell assemblies and sensorimotor interfaces all exhibit the same set of synchronous tendencies as might be found modelling fluid dynamics or pendulum clocks. The applicability of entrainment seems less certain when faced with human behaviours in the social world which to a greater or lesser extent exhibit both automaticity and reflexivity. In the process of playing a groove, musicians appear to pass through different levels of conscious awareness of actions and their consequences. From the way in which musicians speak of playing in time together, it is apparent that they can simultaneously enjoy the experience of a deep sociality, an almost meditative loss of conscious awareness of time passing, and not least the equally important requirement to 'be on top' of

the task in hand in producing an acceptable level of performance for a paying audience. Sociability, spirituality and straightforward employability all may be a part of momentary musical experience. At the same time, the human condition of meta-consciousness whereby we know that we are playing and we reflect on that knowing as we play – adds an extra level of charge to an entrained performance that takes us beyond the realm of fireflies and pendulum clocks. How successfully can a model of entrainment be adapted to account for human sociality and awareness?

Models of interaction

McGrath and Kelly (1986) have developed a social entrainment model whereby much of human interaction is seen through the integration of four components. Firstly, *rhythm* which refers to the endogenous cycles of individual human behaviour; such cycles may include those of turn-taking in conversation, arm swinging tempo and much expressive behaviour (Jaffe & Fieldstein, 1970; Smoll, 1975; Allport & Vernon, 1933, all cited in McGrath & Kelly, 1986, 88). Secondly, *mesh,* a description of the mutual entrainment between individuals (this could also refer to biologically coordinating cycles within an individual) and thirdly, *tempo* which is the resulting, observable dynamic equilibrium between the constituent parts of the model. These first three components are self sufficient in that they constitute a theoretical model of interaction; McGrath & Kelly however add a fourth constituent part which is an environmental component – the impact of any external, driving rhythmicity on the workings of the first three components and this external driver is referred to as *pace*. The authors of this model are distinguishing between *rhythm* and *pace* to accommodate the sense of a social or institutional structure bringing an overarching influence to bear on micro-interaction; in other

words, this is an attempt to reconcile the influence of socio-cultural forces at work in the day-to-day rhythms of individuals.

The above account is an explicitly rhythmic account of interaction. A less dynamicist approach is offered by Levinson (2006) who posits the idea of a human 'interaction engine' at the heart of our sociality. In a not dissimilar position to Trevarthen, Levinson suggests that 'humans are natively endowed with a set of cognitive abilities and behavioural dispositions that synergistically work together to endow human face-to-face interaction with certain special qualities' (ibid, 44).

In face to face interaction, of which live music performance may be considered a subset, entrained behaviours can be observed principally through gesture, body motion and vocal sounds. The everyday synchronous behaviour that one might witness in a conversation between two friends will share many of the features of a musical performance; the difference may well be more in degree, that is the amount of temporal glue that is used in the alignment of moves and sounds; the coordination required in everyday conversation is of a considerably looser, more negotiable style than that required by musicians in the performance of a jazz standard or salsa piece.

Gesture entrainment

The coincidence of gesture and speech has provided much material for the investigation of forms of synchrony in social interaction. This synchrony occurs on two related levels – that of the intra-individual synchrony between gesture and

speech and inter-individual synchrony, the way in which such communicative behaviour is entrained to the speech/gesture patterns of others.

Chapple's work in the 1930s examined the periodicity of turn taking in social settings and viewed such periodicity 'on a continuum of naturally occurring rhythms from the very fast (brain waves, muscle fibre firings) to those with much longer periods (menstrual cycles, migration patterns)' (Clayton, Sager and Will 2004, 12). Consequent separate work by Birdwhistell and Condon further developed analysis of speech and gestural synchrony, Birdwhistell looking at gesture as having syntactic properties; Condon, in the seventies and a decade later than Birdwhistell, was concerned with the interactional synchronies between listener and speaker whose congruence led him to talk of ' entrainment or stimulus tracking' (Condon, 1976, 309 cited in Clayton et al, 2004, 12). Other more recent studies have explored entrainment in social interaction but not necessarily from a gestural perspective.

Bodily entrainment and performance

In this final part of the chapter, I suggest how entrainment may underpin embodied interaction as applied to music performance. In recent work on social cognition, the role of the body has been researched in the way that it contributes to making sense of our social selves and others without the requirement of co-occuring speech (Wilkerson, 1999; Wilson & Knoblich, 2005). Bodily entrainment is considered to facilitate interaction at a relatively low level of intentionality and social awareness, thus leading researchers 'to postulate complex intentional structures that often seem to be beyond human cognitive ability in real-time social interactions…' (Knoblich & Sebanz, 2008). Recent thinking on social interaction stresses that higher level processes emerge from basic action/perception

processes (Clark, 1997). Much of the impetus for this research has come from the recognition that the highly representational, problem solving approach of classical cognitivism did little by way of making sense of human experience. Varela, Thompson and Rosch (1991) played a considerable role in recasting cognition as 'enactive' (the use of the term 'embodied cognition' covers the same territory). While this approach to cognition is by no means universally accepted, there is a sense in which this more ecological, agent-in-the-world view of cognition has pushed the notion of cognition towards an integrated, dynamic perspective.

When musicians play with one another, they are not simply picking up on sounds but those sounds as they are played by consociates. When in each others' presence, the mutual pick-up of visual, aural and social cues add or take away from the level of coordination and synchronising. It has been shown that unintended and intended coordination takes place across a range of participatory interactions (Davis, 1982) and such coordination takes place within an equally striking range of timescales. Further work suggests that such coordination is well described by the dynamic coupling of oscillators, in other words, a model of entrainment.

Within experimental studies where subjects were required to intentionally coordinate their moves either in-phase or anti-phase (at 180°), it was shown that in-phase movements show greater stability than anti-phase moves (Schmidt, Carello, & Turvey, 1990) and similar studies have shown that intentional interpersonal coordination can be understood through the same dynamic processes of self organisation exhibited in intrapersonal coordination (Schmidt & O'Brien, 1997). Schmidt & O'Brien suggest that visual coordination has a strong impact on the tendency to phase lock interpersonally within an intentional task. Within unintentional coordination, similar sorts of entrainment processes seem to

occur although there is no single conclusion on the impact of verbal or visual cues to bodily entrainment (Richardson, Marsh, & Schmidt, 2005).

From the point of view of musical performance, one can imagine both forms of coordination, both intentional and unintentional, coming in to play either sequentially or as they co-occur. Certainly it seems to be the case that musicians playing a repeating phrase that requires intentional coordination will often also move their bodies in synchrony, something that is usually accomplished without the musicians' awareness. While such movements suggest a body entrained to the rhythms that they are producing, the effect of such movements on the other players could be better seen in terms of social rather than musical entrainment. Togetherness and sociality are expressed not only through sounds but also the moves that musicians make in tandem through performance. It has been suggested that visible movements may assist in synchronization, thereby expending less attentional energy (Dahl, In press).

I have suggested that entrainment can successfully model the means through which we engage with musical rhythms and feel a metrical framework. The coupling between musicians is established through joint attention to this framework and this entrained coupling is strong enough to maintain coordinated action but loose enough for these actions to be expressive. Entrainment can be seen as more than a metrical engagement however; studies of social interaction suggest that we need to consider music performance as consisting of multiple entrainments between players including sounding and other body moves, resulting in a complex web of different musical and social ramifications.

3.4 Summary

In the way that musicians talk about groove, it is clear that it evokes feelings of motion and sharedness. In this chapter, I have brought together both of these aspects of groove to develop an intersubjective account of music making through the notion of entrainment.

At the beginning of the chapter, I established the intimate connection between music and motion; different accounts of what musical motion might consist of were examined. Rather than musical motion being a metaphorical construct, perhaps it is better viewed as virtual; the musical meaning of motion can be understood through the theory of ecological perception. Musical motion, however, is also real. When musicians play in time together, a range of body motions come into play whose impetus may be pre-conscious but assists in the overall integrity of the performance.

From examining motion, I have looked at intersubjectivity, an overarching theoretical perspective on the sharedness of human life and proposed that through the mechanism of entrainment, we can usefully view jazz musicians in time together as a cogent form of intersubjectivity, grounded not in abstract notions of self and other but in the varieties of motion and rhythmic engagement between players. I describe this as a naturalised account of a primary intersubjectivity. This mechanism of entrainment is predominantly used to describe shared temporality in music through sound but may also, from a social cognition perspective, explain the body moves of players as a contribution to the sociality of music-making.

A key dimension to this primary intersubjectivity is its emphasis on pre-conscious engagement. In Chapter 4, I introduce a necessary complement to the entrained behaviours of the musicians and this is the idea of the knowledge, here theorised

in terms of 'cultural models' that jazz musicians require to work together. This cultural dimension also has an intersubjective quality but this occurs through the shared cultural understandings and distributed knowledge that are key in performing groove.

4 Cultural models, schemata and the generation of meaning

I have developed the idea that musicians being in time together can be seen as a form of primary intersubjectivity arising from the process of entrainment. Entrainment theory provides a powerful explanation for the basic temporal mechanisms needed to play in time together but it does not provide an explicit account of groove as a meaningful part of a musical culture. It lays the intersubjective foundations of such an account but more is required if we are to develop a rounded sense of groove within performance and its meanings for musicians.

In this chapter, I look at musical intersubjectivity from a rather different angle. The paradigm that I want to explore now moves the thesis towards the idea that the temporal structures that go to make up grooves can be seen as shared cultural models, a secondary intersubjectivity. Whereas entrainment provided a mechanism for the relatively pre-conscious engagement that all musicians need to be able to play in time together, this chapter examines the more overt temporal structures of jazz performance and the internal schemata through which these become meaningful.

The use of the terms model and schema can be open to confusion. In this thesis, I refer to the shared, discursively available, temporal structures of jazz as cultural models; these and the theoretical background to the idea of cultural models are

dealt with in the first half of this chapter. This chapter however also responds to one of the key questions in this study - how is groove meaningful for musicians? While, in part, the answer to this question lies in the ethnographic data, it is also answered by exploring the internal cognitive mechanisms through which meanings may arise. Therefore in the second half of the chapter, I investigate some theoretical perspectives on meaning generation which can broadly be described as schematic, in other words, how models out there in the world may be represented and made meaningful through cognitive schemata.

The chapter concludes with a review of a single paper by Laurence Zbikowski in which he examines the idea of groove through his theoretical work on conceptual models. His approach is significant for my own work in that he develops a perspective on musical knowledge that brings in both the external and internal aspects of shared understanding in music.

4.1 Cognition and interpretation – approaches to culture

The aim of this study is to interpret the meanings of groove that musicians put forward but also offer an explanatory framework for the mechanisms by which groove becomes meaningful. In this manner, the study mirrors a longstanding dialectic in anthropology, the parts that cognitive explanation and interpretation should play in the study of culture.

The notion of cognitive explanation has not always found favour amongst anthropologists. Geertz (1973) was firmly of the view that anthropology could only be cast in the interpretive mould and was one of the most prominent critics of the cognitive tendency within anthropology (D'Andrade, 1995). In articulating a mantra

of interpretive anthropology, he coined the phrase 'thick description' to get at the idea of the layers of meaning which the anthropologist must seek to uncover. Famously he used Ryle's distinction between a 'wink' and a 'twitch' as the key to how thick description should work. The difference between a 'wink' and a 'twitch' cannot be understood through simple phenomenal observation which would identify both as the contraction of a facial muscle; it is only through 'thick description', the textual interpretation of a 'twitch' that we can get to the nuances of behaviour and so explore culture (Geertz, 1973, 6-8). For interpretivists such as Geertz, culture must be understood as an acted document, as public meaning, and he was particularly scathing about an understanding of culture that attempted any sort of re-location towards mental structures,

> 'Culture is public because meaning is. You can't wink (or burlesque one) without knowing what counts as winking or how, physically, to contract your eyelids...But to draw from such truths the conclusion that knowing how to wink is winking...is to betray a deep confusion' (ibid, 12).

The cognitive turn in anthropology shifted the notion of culture from that of a semiotic web, in need of interpretation to the idea that culture is a form of knowledge. This shift in examining culture can be characterised by some broad areas of interest; a focus on the idea of culture as 'what is known' (D'Andrade, 1995), an interest in modes of organised experience such as schema theory and prototypicality (Mandler, 1984), a concern with issues of language and representation (Holland & Quinn, 1987) and an interest in the socially distributed nature of cognition (Hutchins, 1995).

Some would say that the divisions between interpretivist and cognitivist approaches to culture and cultural meaning are overplayed (Strauss & Quinn, 1997). The interpretivist understanding of meaning as a public system of texts in

which meanings are tied to public or material objects, need not be seen in opposition to cognitive approaches to culture and its relationship with mind. As Sperber has pointed out, the study of culture seems to require **both** explanatory and interpretivist approaches if it is to be convincing and it appears to me that espousing either approach to meaning at the expense of the other is to miss out on an opportunity to understand cultural meanings in their richness and complexity (1996).

4.2 Cultural models

Within my own playing experience and through talking to musicians formally within this study, I have become aware of temporal structures having significance for musicians that goes well beyond their notational value or representation on a page of manuscript. The archetypal ride cymbal pattern, the walking bass line, some of the polyrhythmic devices that jazz musicians routinely use, all seem to have strong cultural significance for jazz musicians. They act as templates for rhythmic interaction between players, each to a greater or lesser extent forms part of the groove structures that are heard in jazz and they contribute to the wellspring of shared experience in jazz.

The notion of a cultural model seems to come close to describing these temporal structures that define the sounds of jazz, that have an affective component for musicians and indeed contribute to the sense of a being part of a jazz community. But what does it mean to speak of a cultural model? How do these temporal structures fit within such a concept?

In the following sections, I lay out some ways in which cultural models have been conceived and look at how the cognitive analogues of such models may contribute to our understanding of how meanings arise in music.

Sapir-Whorf Hypothesis

One of the earliest attempts at a cognitive understanding of cultural meaning hypothesised that cultural categories expressed in natural language influence human thought. The Whorfian hypothesis, also known as the Sapir-Whorf hypothesis was the first anthropological model to propose that thought is organised through the mechanism of language – that is looking to intersubjective structures for an understanding of cognitive process. At the time (Sapir and Whorf's ideas emerged between the 1920s and 1940s, Benjamin Whorf being Edward Sapir's student), the Whorfian hypothesis constituted a radical shift in the understanding of cultural meaning. The key result of this view was to emphasise that perception of the world is grounded in relativism. According to Whorf,

'We dissect nature along lines laid down by our native language…We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way…all observers are not led by the same physical evidence to the same picture of the universe' (Whorf, 1956, 212).

This anthropological assertion of the primacy of spoken culture on cognition could be said to be mirrored by similarly radical changes in philosophy during the middle part of the last century which emphasised the relational nature of language and its constructing effects; this was a move away from viewing language as a sort of photographic representation of a world 'out there' towards an understanding of

meaning in language that developed through use (Wittgenstein, 1953). While relatively few scholars would nowadays support the strong version of the Sapir - Whorf hypothesis, namely that thought is solely constructed through language categories (Cook, 1998), there is evidence that perception is modified by the natural language categories of the speaker to some extent, albeit in a limited way.

Experiments have shown that when colours are presented to speakers of languages that have greater or lesser verbal discrimination between shades, there is some effect of linguistic coding on colour perception (Kay & Kempton, 1984). But Kay and Kempton also showed that the perceptual effects of language on decoding colours works only in particular circumstances where perceptual differences in themselves are considerable – language does have a place in our construction of reality but this is not nearly as great as Whorfian scholars suggested.

The Whorfian view of cultural meaning attaches much importance to language in the shaping of meaning. In the case of music with its 'floating intentionality' as described by Cross (2005), a less logocentric view of thought and cultural meaning is required. The significance of the temporal structures of music seems to lie in the very manner in which they go beyond words – there is a bodily, felt quality in the execution of the models which also carries considerable weight for musicians. The way in which musicians in this study felt and described the shared temporal models of jazz is examined in Chapter 7. At this point, I go on to look at contemporary understandings of culture as a set of models.

Contemporary understandings of cultural models

Since the Sapir-Whorf hypothesis was put forward and especially over the last twenty five years, more work has been conducted on the nature of cultural intersubjectivity and how this occurs. D'Andrade defined a cultural model as 'a cognitive schema that is intersubjectively shared by a social group' (D'Andrade, 1987). Such models act to integrate different experiences within a conceptual whole. In the case of a music performance, musicians will call on a range of shared understandings which enable them to carry out the task and make sense of the shared activity; in jazz, these include the ride cymbal pattern and walking bass line that are iconic of the jazz sound.

The intersubjective knowledge that is reflected in a cultural model has a number of features. Firstly, such models provide an 'isn't it obvious' basis for understanding the world. D'Andrade gives a good example of American baseball in which typically the majority of spectators cannot see the ball (the stadia are too large and the balls too small) and yet on the basis of intersubjective knowledge – why that man is holding a large piece of wood, when he swings it, and so on – any Americans can *see* this invisible object. To any outsider who had the misfortune to have never come across a baseball game, they might well experience considerable confusion about exactly what was going on. The second related feature is the implicit understanding of rules. A good example would be the understanding amongst jazz audiences that one should clap a soloist at the end of their solo. Much of what contributes towards a cultural model whether that is in sport or music performance involves unspoken rules that are well understood by the participants. In the same manner, within jazz performance, rules apply about when and how to use the temporal models, such as the ride cymbal pattern, in the course of performance.

One of the questions that have repeatedly engaged anthropologists is the extent to which fluidity and fixity are understood to operate for the inhabitants of a culture. In what senses can we say that there are shared or separate understandings of common cultural symbols? To what degree are these cultural meanings subject to change or sameness? In a jazz context, to what extent can musicians be said to share the idea of a walking bass line?

There are few straightforward solutions to these questions but Sperber has intriguingly discussed the idea of cultural epidemiology – the sense of culture as contagious in its spread (1996); this is an approach not so different from Dawkins' idea of cultural memes (Dawkins, 1976) but one which emphasises the cognitive element in cultural transmission. For Sperber, the key to transmission lies in representations – both mental and public. Cultural objects, created by the actions of individuals are subject to particular causes as they spread within and beyond communities. Within a music community such as jazz, one can see how even abstract cultural objects such as 'musical time' are shaped by individual variance, the impact of technologies (players' timing on recordings will often be routinely 'cleaned up' in a way that was unthinkable even thirty years ago), and contact with other musical cultures bringing in new perspectives on how to play time, for example, the influence of Cuban and Brazilian musics on jazz.

The way in which understandings are shared, not in terms of cultural contagion, but in the way that objects in the world are categorised has also attracted considerable attention from researchers. Psychologist, Roger Brown, was the first to examine the way in which categories are most frequently assigned to cultural objects and found that objects are classified most readily by a level of category that has come to be called the basic level (Brown, 1958; cited in Zbikowski, 2002, 31). The basic level, contrary to vernacular usage, corresponds to the middle level

of a taxonomy which by virtue of not being too broad or too specific becomes the most useful way to categorise objects. Examples of such of levels of category would be book (basic level), media (superordinate level) and novel (subordinate level). The basic level has a number of psychological characteristics,

> 'it is the level at which subjects are fastest at identifying category members, the level with the most commonly used labels for category members, the first level named and understood by children, the first level to enter the lexicon of a language' (Zbikowski, 2002, 33).

Each of these contribute to its having the most cognitive salience for humans. Zbikowski has looked at categorisation as a way of exploring the cognitive underpinnings of musical comprehension; in his exploration, he sees the musical motif as an example of a basic level category. Later, in Chapter 7, I will be looking at equivalent temporal models that exhibit a similar form of salience.

The means whereby cultural knowledge is jointly shared has been examined by Strauss and Quinn (1997) and particularly Quinn, as she investigated attitudes towards marriage within the United States. For Quinn, this research on a 'shared task' such as marriage led her to the conclusion that although there is a strong set of commonalities between individuals when they express their feelings about marriage, there was considerable malleability in this cultural model. Indeed, one of the results of this work was to re-position her interpretation of the analysis from uncovering *the* cultural model of marriage to *a* cultural model of marriage. So within the idea of a shared model, Quinn uncovered a set of understandings that enjoyed considerable variability.

Two problems present themselves in the work of the authors mentioned above. Firstly, there is a lack of rigour in their use of terms. Often, it is not always clear whether they distinguish between models as material culture or cognitive

representations of the material. The use of the word schema, which I have tried to use solely in a representational sense is used too freely as a synonym for model. In one way, this mixing of terms for internal and external forms of model underlines the relatively thin divide between them but it seems to me essential to distinguish between the mental constructs of musicians and the publicly available, material sounds of the music. This is not consistently achieved in much of the writing.

The second problem is the overwhelming concentration on linguistic models. The reason for this may well lie in the development of cognitive anthropology as a discipline with an emphasis on semantic analysis of kinship terms and similar analyses of feature models for different cultural domains (D'Andrade, 1995). It is not always clear from the work of the writers cited above whether cultural models can indeed exist outside of linguistic form. As becomes evident in later chapters, musicians do not necessarily have a verbal counterpart to the temporal models that they use – they may well be able to sing such models or tap them out but not always describe them in shared theoretic terms.

Of the different theorisations of cultural models, the work of Bradd Shore has done most to resolve these issues (1996). He makes a clear distinction between linguistic and non-linguistic models and also between models as schematic constructs and models as part of material culture.

Shore develops his theoretical perspective by laying out a comprehensive taxonomy. The mental model corresponds directly to the connectionist idea of a schema. There are two forms of cognitive model that Shore defines. Firstly, personal mental models which may be entirely idiosyncratic, such as the sort of map we may carry in our heads of a local area which can vary considerably in detail and imagery from person to person. Secondly, he cites mental models that

are considerably more shared – conventional models - which although fundamentally the same in structure as a personal model are more socially constrained; examples of conventional mental models would be learned ritual practices or internalised social conventions that contain some high degree of peer pressure in the way that they are carried out, for example, modes of dress or conversation. As Shore makes clear, such models cannot be seen as mutually exclusive; behaviour emerges from the blending of such models. Complementary to internal models are instituted models which are the external, visible products of the social world; of the many examples that could be given, obvious examples could be styles of music, buildings and forms of greeting.

When referring to schema in this study, it is with reference to models as cognitive structures and it is in the sense of a publicly available form of knowledge that I use the term model.

Distributed cognition

I now focus on another understanding of the sharedness of cultural knowledge and this is a perspective that to some extent removes the divide between models as cognition and models as exterior. Edwin Hutchins' radical perspective in particular focuses on intersubjective aspects of knowledge and denies cognition an internal locus. Instead it is seen as a distributed system of artifacts, social roles and shared knowledge. It shares some points of contact with the Gibsonian view of cognition as an interaction with the environment but the emphasis here is on cognition as a network.

Learning how play in time with others, the subtleties of balancing one's own confidence in timekeeping with the requirement to serve the needs of the group is

not something that can be worked on simply by playing with a metronome or drum machine. Grooving together in particular requires a distributed competence and shared understanding that emerges through group activity. It is clear that groove is not the property of the individual but rather can only be achieved through the group – a distributed temporal engagement. The idea that cognition is mediated through social forces is not a recent one; it has been explored sociologically since Durkheim but recent work in cognitive science has also sought to challenge the idea that our cognitive capacities lie only in the individual.

The attraction of this distributive notion of cognition lies in the sense that it attempts to account for what happens in cultural and work settings where no single cognitive agent can be said to 'contain' all the elements that make up the whole. Edwin Hutchins has used Micronesian navigational systems, the navigational system of a US Navy warship and cockpit of an airliner, all for the basis of his study of distributed cognition (Hutchins, 1995; Hutchins, 2006). While language plays a central part in this distribution, Hutchins is also interested in the way in which other artifacts, technology and shared knowledge take the cognitive load outside of any single mind. For Hutchins, the distribution of cognitive labour can lead to supraindividual cognitive effects, these are cognitive properties which are distinct from the cognitive properties of the individuals in the group. Such an approach to cognition views interactions with others, with material culture and between past and present as all systems within the distributed perspective. In social interactions, one can therefore view cognition as something that may be shared amongst a group in the same way as physical labour may be shared out to accomplish a task. Distributed cognition in the sense of interaction with the material environment can be said to act as a cognitive amplifier; in this way, one can see how the sensitivity to groove that musicians develop over years comes

about through participating in this shared task and something that couldn't come about without this distribution of knowledge and interaction (Bruner, Olver, & Greenfield, 1966).

For proponents of distributed cognition, 'cognition has nothing to do with minds nor with individuals but with the propagation of representations through various media, which are coordinated by a very lightly equipped human subject working in a group, inside a culture, with many artifacts and who might have internalized some parts of the the process' (Latour, 1996). Hutchins and other culturally motivated cognitivists suggest that a much more diffuse view of cognition is required; that the boundaries between mind and culture be understood as being rather more malleable than classical accounts of cognition would allow.

Hutchins account of cognition may have some bearing on musicians working together towards groove. As Hutchins describes in relation to navigating a ship, there is a rich interconnection between the division of labour, the social relationships, the tools of the job (which include sophisticated shared understandings that the participants use) and the embodied accomplishment of the task at hand. The blurring of these bounded areas of human activity seems to me provide a step forward in understanding musical activity as it occurs in the moment.

Hutchins has relatively little to say about sub-personal mechanisms. Clearly, individuals do have mechanisms for making sense of the world and at this point my review moves to the internal, schematic side of cultural experience – the internal cognitive mechanisms through which a task such as grooving comes to be meaningful for the participants.

4.3 Schemata – mechanisms for meaning

Schemas enjoy a complex provenance within contemporary cognitive and anthropological thought. The foundations of modern schema theory may lie in artificial intelligence but they have spread far beyond this and through the core of contemporary psychology (Anderson, 1980; Minsky, 1975). A number of studies, Brewer and Treyens amongst others (1981, cited in Anderson, 1985, 125) have provided demonstrations of the psychological reality of schemata and how they organise experience.

The idea of schemata structuring our engagement with the world is not novel; Kant, as early as the late 18th century was using the term to describe general mental 'pictures'. His ideas were an attempt to solve the sceptical problem lying at the heart of philosophical approaches to knowledge since Descartes – how do we know that our ideas reflect the world? Kant's way of resolving this was to maintain that we understand the world through a combination of sense impressions and the human, conceptual intellect that structures these material sensations. Since concepts are shared, then objective knowledge of the world must be possible through the organising of experience by these transcendental, general concepts (Johnson, 1987). It is not always clear whether his use of the term corresponded to an understanding of schema as process or as a product. Whatever the case, it is true that Kant's formulation of schemas as involving *imaginative* functions corresponds to some contemporary understandings of meaning generation, for example, the work of researchers such as Lakoff and Johnson (Lakoff, 1999) who have developed the notion of *image schema* as a means of grounding human reason and imagination in the same mechanism. The first use of the term in psychological literature appears in the early part of the 20th century with the work of Head and Holmes on patients' perceptions of their bodies (Head & Holmes,

1911, cited in Gregory, 1987, 696). The use of the term has also long appeared in developmental psychology; Piaget used the word to describe the 'internal representation of some generalised class of situations, enabling the organism to act in a coordinated fashion over a whole range of analogous situations' (Gregory, 1987).

Although there are clearly different uses of the term and different terms that get used to describe the same sort of mental construct (frame, script, model etc) within various disciplines, there is a general consensus that schemata operate to organise our experience – they are a means of categorising the data presented to us and so allow us to interact with the world on the basis of such understandings. Schemata, as generally conceived, give us the broad experiential framework within which we can slot all the various, changing experiences that happen to us day by day into meaningful sets and they can function to create more complex concepts and plans through hierarchies (D'Andrade, 1995).

The answer to the question of how the fundamental structures of thought are shaped may seem too distant from the world of music performance to be of consequence but it has been argued that for a musical culture to exist in the first place, there must be distinct thought processes which are implicit in the shared understandings involved in playing music. Nicholas Cook has argued that the theoretical understanding of music essentially involves metaphorical thought processes and as mentioned earlier, he proposes a definition of a musical culture as 'a repertoire of means for imagining music' (1990, 4). Although Cook is largely concerned with the structures and analysis of Western art music, his argument is of relevance to musical cultures in general in that he makes clear how music exists in such a close relationship with the aesthetic discourse around it. The conceptual grounding of music theories and aesthetic approach has been examined by

Zbikowski but more from a cognitive rather than musicological perspective (Zbikowski, 1998; Zbikowski, 2002). Zbikowski's work appears later in this chapter through his examination of groove as a set of 'conceptual models', his terminology for the basic cognitive structures underlying conceptual thought. At this point, it is worth exploring some contemporary accounts of schemata which may help explain how musicians theorise about and derive meaning from the grooves that they play. Over the next two sections, I look at two complementary, contemporary theories of representation and meaning, both of which arise from the idea that cognition involves the body.

Embodied cognition contains no single approach to the understanding of human cognition. Rather, it can be seen as a very broad term that includes a suite of perspectives on cognition that argue against the classical view of human cognition as the representation of the world through amodal, logical, disembodied symbolic processing. The embodied view, which is close to other recent perspectives such as grounded or situated cognition, places human agency and agents' bodies in a much more central position in accounting for how we are able to function in the world. My aim here is not to give a detailed account of these perspectives but to make use of two complementary approaches which have explanatory power in looking at the ways in which groove is meaningful.

These two theoretical approaches are useful for my purposes as they respectively focus on rather different areas of intersubjectivity, language and bodily behaviour but from the same sort of schematic perspective.

Experiential realism

The theory of experiential realism, developed by George Lakoff and Mark Johnson (1980) is an account of the embodied mind that has developed out of linguistic approaches to cognition. Johnson has described the classical cognitivist account as one that leaves out the human element. Classically, the cornerstone of Western thought, rationality, is seen to transcend the structures of bodily experience (Johnson, 1987) but Lakoff and Johnson directly oppose this account of human experience and rationality through their developing a notion of categorisation that is *dependent on* rather than *transcendent of* the body. These basic conceptual structures, described by Lakoff and Johnson as 'image schemas', are embodied categorisations which are directly tied to perceptual and motor systems (in a way that abstract symbols are not). From these broad schemata emerges a basis for our linguistic communication about the world. What is perhaps most radical about this theory is the idea that the embodied image schemata underlying thought can account for markedly different domains of experience through a process of metaphorical transfer. Metaphor has generally been understood as a linguistic, figurative device, part of the larger linguistic category of tropes. Within experiential realism, metaphor in language is simply the overt expression of a more profound aspect of cognition, our capacity to transfer experiences analogically across different domains.

In more detail, the theory can be seen to possess two parts. Firstly, the image schema is proposed as the first half of the process of meaning construction. Experiential realism suggests that

> 'as animals we have bodies connected to the natural world, such that our consciousness and rationality are tied to our bodily orientations and interaction in and with our environment. Our embodiment is essential to

> who we are, to what meaning is, and to our ability to draw rational inferences and to be creative' (Johnson, 1987).

The image schema that Johnson puts forward as lying at the heart of meaning construction should not be regarded as the same as other recent cognitive uses of the term. The schema described in much of the connectionist literature tends to be more propositional in nature whereas Johnson is thinking of a more 'imaginative' structure, one that is tied to perception and body movement; image schemas are not images or plans for action in his conception but very general consolidations of experience that exist across the perceptual modalities.

The example of such an image schema that has been used in experiential realism is that of 'balance' (Johnson, 1987). Our experience of balance as we move in the world passes without comment, and yet as bipedal, upright beings, our sense of balance is completely fundamental to our survival. Like other basic image schemata, balance is not something that we learn through explicit rules or concepts, rather it is something that we learn through our bodies. Johnson argues therefore that we come to an understanding of the meaning of balance as a *concept* (for instance, in making a fair legal judgement) through bodily experience. The meaning of 'balance', for instance, in the way that we think of justice being served through the image of weighing scales, is ultimately grounded in an experience of 'balance' in bodily systems which is repeated and strengthened through repetition. The crucial point about such experiences is their embodied nature and their capture in our experience at a low level of specificity. So how does bodily balance become a sense of justice?

The second key idea in the theory of experiential realism is the sense of metaphorical transfer between different domains. Metaphor, in this cognitive sense, works through a series of motivations – these could be seen as the types of

correspondence that allow the constituents of a metaphorical construction to be related. These motivations have been broadly identified as correlations between experiences or resemblances in structural similarity between two domains (Grady, 1999). Any two domains however that go together to form a conceptual metaphor of the form, *A is B,* do not share equivalent motivational impetus; firstly, the correspondence between two domains is only ever partial (if the correspondence between *A* and *B* was complete, then there would be no metaphorical conjunction) and secondly, the metaphorical understanding arises because of the flow from one domain to the other, that is from the source domain to the target (Kovecses, 2002). Source domains are typically more concrete than target domains and it is through the application of the source domain that we interpret the target domain. Common examples of source domains include, ideas of movement and direction, the human body, light and darkness, heat and cold; target domains tend to be more abstract and it is their very lack of specificity that renders their association with a source domain so powerful in everyday language; examples of target domains that are readily metaphorised would be emotions, human relationships and time.

The relationship between the theory of experiential realism and more general theories of schemata is clear; both are concerned with characterising the principles by which we make sense of the external world within the mind. The differences lie in conceptual metaphor theory being proposed as a specific challenge to many of the dogmas associated with western philosophical thought such as the disembodied basis of reason, the dichotomy between perceptual and conceptual modes and the supremacy of reasoning over imagination. Experiential realism acknowledges the primacy of embodiment in our imaginations and rationality.

The relevance of experiential realism for this study is that it provides a coherent account of the generation of linguistic meaning from non-linguistic embodied experiences (such as music). From the introductory chapter, it is clear that musicians use combinations of literal and figurative language when they talk about groove. Examples were given of musicians likening groove to social states such as marriage and as has also been shown, music is frequently described in terms of spatial/motional metaphors. This language use could be seen of course as just musicians being rather poetic. Lakoff and Johnson's point is that metaphoric language is the overt expression of a cognitive capacity that goes much deeper and in fact allows us to construct a network of meanings from the world.

The second approach to meaning generation is not dissimilar to experiential realism in its emphasis on perceptual experience yielding conceptual meaning. The theory of perceptual symbol systems, however, provides an understanding of meaning generation that is not necessarily language based in its output and is a more thorough cognitive account of how meaning is derived from fundamental experience.

Perceptual symbol systems

A number of theories that reject the classical, disembodied view of cognition have emerged over the last decade. For example, situated-action theory shares similar concerns with experiential realism, emphasising our interaction with the environment and focusing on the part that perception and action play in cognition (Clark, 1997; Clark & Eilan, 2006). Of interest in this study is Laurence Barsalou's work on perceptual symbols which proposes that concepts and ideas are grounded in the perceptual information that the mind retains from bodily and

introspective experience (Barsalou, 1999; Barsalou, 2003). The significance of Barsalou's model for groove is the way that it integrates bodily movement, perception and affect within a single framework, from which we may derive meaning. This model is an impressive attempt to bring embodied experience to conceptual thought and so is potentially useful in understanding the provenance of meaning within the bodily experience that is groove.

According to the theory of perceptual symbol systems, concepts are derived not from the amodal, symbolic representations described by standard theories of cognition but from modal, perceptual symbols. In this way, cognition and higher thought processes are linked directly to the sensori-motor system.

The distinctive part of Barsalou's work shares some overlap with other new research on the grounding of abstract concepts within the sensory motor system (Gallese & Lakoff, 2005). In Barsalou's model, there is no translation from a perceptual input into a novel, arbitrary representation. Instead, perceptual symbols, the recordings of neural states in the sensori-motor system, are assumed to underlie not just perceptual but *conceptual* knowledge. The dynamic, partial recordings of a perceptual state are selectively extracted into related groupings, broadly equivalent to the idea of schemata. Barsalou contends that these fluid aggregations of perceptual symbols have the capacity to account for both stable concepts and individual instances of these (i.e. types and tokens).

The idea that concepts are grounded in sensori-motor 'recordings' has some support from neuroscience. Evidence suggests that sensori-motor regions of the brain are activated in knowledge recall (Damasio, 1999) suggesting that knowledge of something involves understanding how that 'something' was done and within music perception, studies have shown how our motor systems are

activated when auditory images are activated, that is, we activate parts of the brain responsible for action when we perceive musical sounds (Iyer, 2002).

Barsalou (1999) suggests that although amodal classical symbol systems work well as models in representing propositions and abstractions, in the light of recent research such models appear less convincing because there is little satisfactory understanding of how perceptions become transduced into amodal symbols and even less understanding of how amodal symbols are ultimately grounded in physical referents. Barsalou's theory overcomes many of these problems by retaining much closer connections between perception and symbolic operations. In perception, sensori-motor neurons in different regions of the brain respond to events in the environment; a perceptual symbol is the record of such activation and symbols that may be used in abstract thought are grounded in physical experience (Gibbs, 2005). Where Barsalou's work becomes most relevant for this study is his development of the theory as a means for understanding the links between social settings and embodied states (Barsalou et al., 2003) and the link between bodily states and social cognition is particularly interesting for music performance in that it allows, from a cognitive perspective, a much tighter fit between movement and social (and cultural) meaning (Barsalou, 2007).

Barsalou has proposed that the different types of embodiment effects that are widely reported in social psychology literature can be successfully accounted for in an integrated manner within his theory. He cites four principal effects that co-occur between social stimuli and bodily states. These are that 1), social stimuli produce bodily states, 2) embodied states in others produce similar states in the self, 3) embodied states in the self induce affective responses and 4) performance is affected by the compatibility of embodied and cognitive states (Barsalou et al., 2003).

Barsalou gives many examples of these four types of effect only a few of which are cited here. The fact of social stimuli producing embodied responses is exemplified by the way in which learning of one's grade in an exam affects posture (Wiesfeld & Beresford, 1982, cited in Barsalou et al 2003, 46); that embodied states in others produce similar states in the self is shown by studies demonstrating postural synchrony between individuals (Bernieri, 1988; cited in Barsalou et al 2003, 50). Other studies show how arm motions involving pushing or pulling can induce affective states thus indicating the body as an affective stimulus (Cacioppo et al, 1993; cited in Barsalou et al, 2003, 53) and finally, Barsalou cites work that shows the improvement in performance as bodily, cognitive and affective states show compatibility (Barsalou et al, 2003, 56). It is clear from this tranche of research that performance is superior when cognitive and bodily operations are harmonised, viz, 'motor movements are faster when they are compatible with affective states. Memory is optimal when movements are compatible with the affective valence of remembered material. Face processing is optimal when the perceiver's expression matches the perceived expression on a face' (ibid, 80). Redundancy between different operations may be key to this sort of compatibility benefit. That is, greater resources may be available for processing when embodied and cognitive cues are attuned. As this approach requires that motor processing systems are involved in cognitive operations through simulation of conceptual knowledge, then there is optimal performance when both cognition and action are driven together.

In proposing that a multi-modal system of perceptual recordings exists to re-enact prior experiences and make sense of current ones, then Barsalou offers a unified account of how bodies, social situations and the resulting affective/cognitive responses form a complex, dynamic whole.

How does this work fit in with this study? While Lakoff and Johnson's approach helps in our understanding of the significance of musicians talking in particular ways about groove, Barsalou's work appears to offer a similar mechanism for meaning generation but one that includes bodily states as part of the output.

4.4 Groove as a model

So far in this chapter, I have looked at two sides of cultural meaning. Firstly, through the idea of cultural models as external, shared experience and secondly through internal schemata that help explain the means whereby we make sense of the world through embodied experience. I want to finish this chapter by focusing on these elements as they have been applied directly to groove and look at a single paper that brings together some of these different ideas.

Lawrence Zbikowski's paper on groove is influenced by the work of some of the theorists considered above. He asks at the beginning of his development of a conceptual framework for popular music, '...what is it that musicians know when they know a good groove?' (Zbikowski, 2004). It is a challenging question to ask in the light of both the ephemerality of rhythmic feel in performance and the sometimes obtuse descriptions of groove from musicians, examples of which are cited in Paul Berliner's study of jazz (Berliner, 1994). Zbikowski himself comments that such descriptions are not an indication of musicians' being inarticulate but more point to the difficulty of putting rather ineffable musical feelings into words.

To account for groove, Zbikowski outlines an approach that has been discussed above, one that proposes the idea that culture is 'not a people's customs and

artifacts and oral traditions, but what they must know in order to act as they do, make the things they make, and interpret their experience in the distinctive way they do' (Quinn & Holland, 1987). The approach taken involves defining what may count as musical knowledge and formalising this knowledge into what Zbikowski terms 'informal propositions', these being internalised cognitive structures that together form a coherent conceptual model (such 'informal propositions' can be seen as premium categorical attributes and values; the conceptual model is developed more fully in an earlier work (Zbikowski, 2002).

The musical knowledge within this model is taken to be something broader than declarative knowledge. Musical knowledge also includes tacit proprioceptive information as well as more conventional notions of music-theoretic understanding. The expansion of this model of musical understanding to include an embodied knowledge relies on Zbikowski's bringing together the sense of cultural knowledge outlined by Quinn & Holland (1987) and the theoretical work developed by Barsalou (1999). Zbikowski uses these ideas to create 1) a basic conceptual model for rhythm and 2) models applied to particular instances of groove. His basic conceptual model for musical rhythm consists of four informal propositions:

P1	Rhythm concerns regularly occurring musical events
P2	There is a differentiation between rhythmic events
P3	Rhythmic events are cyclic
P4	There is a strong sense of embodiment associated with musical rhythm

As I have explored earlier, the fundamental assertion that our knowledge about music is grounded not just in conceptual but also embodied understanding makes

considerable sense and fits in with much contemporary thought on how we build conceptual thought (Lakoff, 1999; Lakoff & Johnson, 1980; Varela et al., 1991). The propositions that Zbikowski outlines act as some sort of conceptual guide for musical understanding. Faced with a sample of sound, then these informal propositions are activated to some degree. Such propositions have both their conceptual and embodied characters based in fundamental schema such as regularity, differentiation and cyclicity. These schemas can be seen to operate in the way that Lakoff and Johnson and Barsalou underline – they develop as abstract concepts through repeated bodily experiences. These concepts are then re-used in the course of action to act as a frame within which meaningful acts can take place.

It is not my intention at this point to go into a full exposition of how groove may be structured through the organisation of smaller discrete temporal-cultural models. This forms part of my analysis of the performances and is dealt with in Chapter 7. However, as Zbikowski looks at one of these models within his work, it seems appropriate to take the single jazz example that he gives and look at this in more detail. The particular model that he cites is the idea of the *2 and 4* temporal model as it appears on a Miles Davis album.

It is possible to conceive of the 2nd and 4th beats of the bar in jazz simply as agogic accents, as indeed they are, but the idea of *2 and 4* in jazz seems to be more than this; it is a simple but extremely important model in the construction of a jazz feel. In the following section, there is an illustration of how a simple musical model such as this serves not only as a means of clarifying metre (London, 2004) but also forms part of the shared knowledge that musicians use to construct a cultural identity.

The *2 and 4* frequently begins life within a jazz performance before a note is played. Bandleaders will usually count in a tune with an accompanying finger-click on what becomes the 2nd and 4th beats of the piece. Zbikowski focuses on this in an analysis of a Miles Davis track 'If I Were A Bell' (Davis, 1956). Miles Davis clicks his fingers 8 times in the manner of a hihat (see Chart 1 below) before Red Garland, his pianist for that session, enters on piano.

Zbikowski points to the disruption that we feel on hearing the entry of the piano on beats 1 and 3 and so highlights an important point about temporal models within a musical culture – this is that for audience and players, it cannot be assumed that both will be working from the same model. The reason that Zbikowski uses this example is that for non-literate listeners, the finger click sets up an expectation that it lies on beats 1 and 3 (simply because for most listeners, the first sound will tend to be heard as beat 1; anacrusis or a similarly displaced beat will only become clear as the piece develops and we metricise the piece [1].

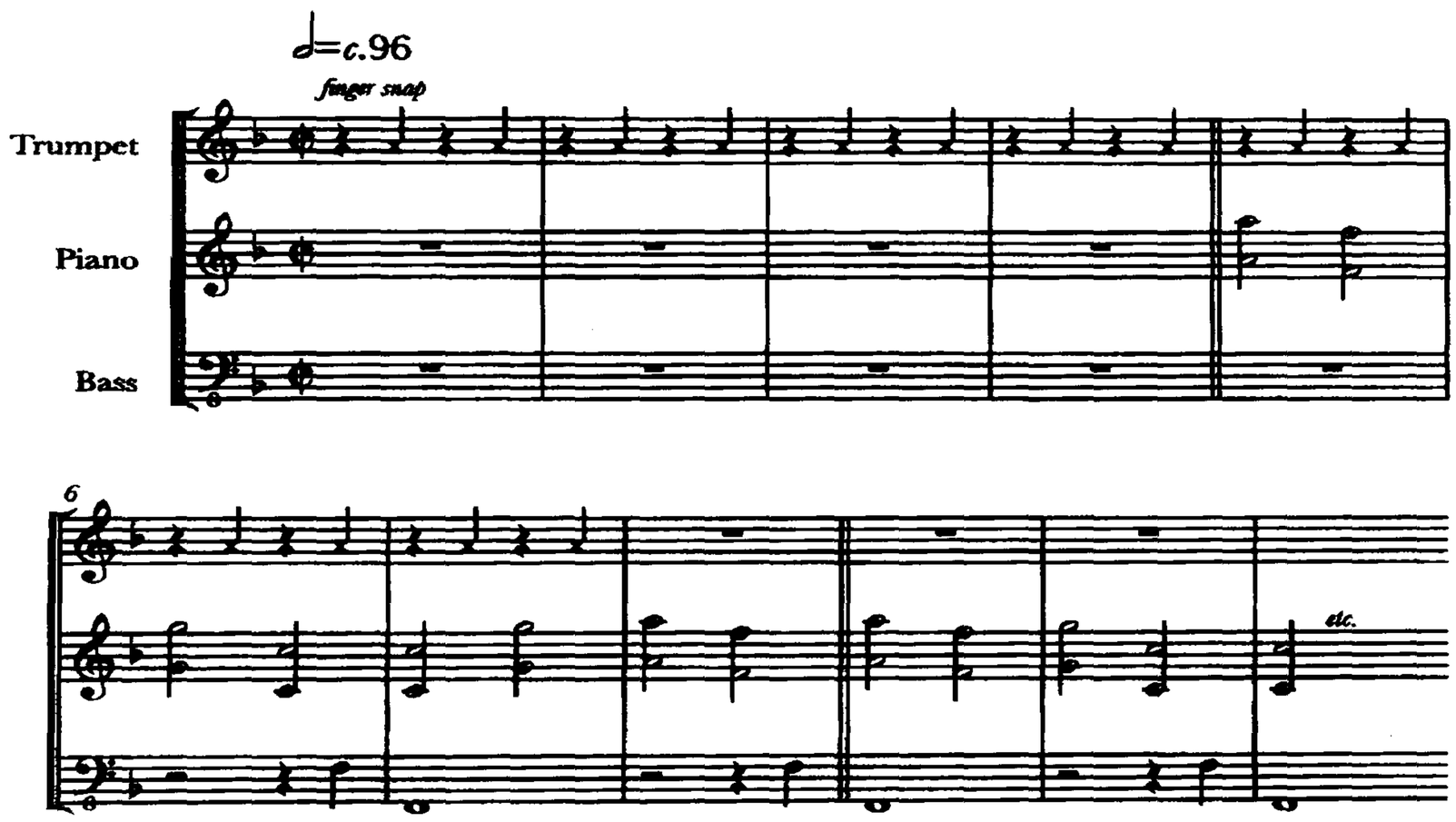


Chart 1. Transcription of 'If I Were A Bell' – introductory 8 bars (reproduced from Zbikowski, 2004).

If there is a disruption here or not, the significance lies in a *cultural* knowing of what the finger snaps refer to, that is beats 2 and 4 – not dissimilar to the

distinction that Geertz understands between a 'wink' and a 'twitch' referred to in 4.1. The *2 and 4* for musicians are not just points in time but part of their sense of themselves as jazz players.

Most jazz musicians will have had the experience of a band leader, who may not be a jazz musician but wants to incorporate the music in his set, counting off jazz standards with the finger click on beats 1 and 3. It is significant how embodied behaviour and identity can be so intertwined at those moments. As an aural cue into a song, the positioning of finger clicks on 2 and 4 or 1 and 3 provides the same *timing* information – the interonset intervals will be the same - but each provides an entirely different cultural resonance for the players.

Zbikowski in looking at such models formulates a way to integrate the music-theoretic, knowable and embodied bases of groove. There are however some areas in which this approach could be extended.

At the beginning of his article, he suggests that the *social* interactions that form a backdrop to groove are integral to its understanding. As he develops his proposal that embodied conceptual structures underlie the production and perception of a groove, the social nature of such interactions are left rather unstated. Since he refers to the social embodiment work of Laurence Barsalou, the implication is that the embodied nature of temporal interactions while playing groove will have an automatically social nature but this is left underspecified.

Secondly, Zbikowski acknowledges that he is focusing on groove as a notatable structure. This is a reasonable position to take - groove is often described in structural terms by those who perform it and analyse it (Pressing, 2002) but he concludes his article by acknowledging that more could be done in his approach to musical knowledge to include the shared feeling of time that groove also implies. The contention throughout my study is that a rich understanding of groove *must*

include its performed, immediate and expressive side as well as the structural, conceptual aspects and understand the ways in which they interpenetrate. This is explored further as I introduce the performance data in the subsequent data analysis.

4.5 Summary

This chapter has concluded my review of the theoretical foundations to the study of groove and its meanings and it may be useful here to summarise the first half of the thesis before moving on to my methods and my findings.

The overarching theme in this first part of the thesis has been to reflect the shared temporality that is held to be central to groove within the theoretical framework of intersubjectivity. This framework provides a sufficiently broad outline to the study to be cohesive yet does not prejudge the findings in the performance and interview data; rather it indicates the general tone of my thinking about groove and has stimulated more targeted research questions which are set out in the next chapter.

At the beginning of the thesis, I laid out preliminary understandings of groove from within the jazz community and some of the perspectives on groove in the literature; I described a tendency in the literature towards understanding groove in a compartmentalised way, either through empirical studies of microtiming with a psychological bias or cultural studies with their emphasis on social context. This separation seems damaging to studying the phenomenon itself and also in the interests of greater disciplinary integration.

My theoretical review began by examining the diverse nature of musical meaning and my approach involved looking at a range of perspectives on, each of which

could be seen as corresponding to perspectives on linguistic meaning. The approaches to musical meaning which I characterised as increasingly pragmatic were seen as having more relevance to the understanding of groove. Keil and Monson, exemplars of a pragmatic approach, understood the shared nature of groove and how it means but both left more work to be done in specifying the nature of this sharedness.

In Chapter 3, I set out the first paradigm of sharedness which characterises groove –that is as a form of primary intersubjectivity. The exploration involved a synthetic approach. If intersubjectivity is to be understood within a non-verbal domain such as music, then non-linguistic ways to understand the intersubjective must be examined. As a precursor to primary intersubjectivity, I therefore introduced as a first thesis, the sense of motion in music as a way of developing how music is meaningful that avoids recourse to an unduly linguistic perspective. The second thesis involved moving away from music and to a general understanding of intersubjectivity as a fully theorised way of understanding sharedness. The synthesis of these two complementary strands was through the notion of entrainment which takes account of motion and sharedness through its modelling the relational, periodic behaviours of independent oscillators within a complex system. Entrainment theory appears to provide a model of music-making that understands motion and temporality as the dynamic, embodied foundations for intersubjective experience to take place. The chapter went on to explore how entrainment theory has become a useful tool in understanding cognitive production and perception in music performance but also provides insights into the gestural aspect of performance and ways in which social interaction is underpinned by the primary intersubjective effects of unmediated, entrained behaviour.

While entrainment accounts for musical intersubjectivity at a primary level, it does not account for the reflexive, knowledge-based accounts of music making which need to be included for a full understanding of musical sharedness. In this fourth chapter, I have laid out a second area of intersubjectivity, the shared knowledge, here conceptualised as cultural models that musicians need to know to be able to play with one another.

In the first part of the chapter, I examined the theoretical background to such models arising from the shift towards cognitivism in anthropology and saw this as part of a growing move towards explanation and away from interpretation. I distinguished between the model as an exterior cultural form and the cognitive representation of that form, the schema, suggesting that these two forms are often conflated in the literature. Two approaches to cultural cognition were found to be most useful in understanding shared cultural constructs, the work of Bradd Shore and Edwin Hutchins. Hutchins is most radical in that he proposes cognition as exterior to the mind of any individual. While finding this account useful in making sense of work that emerges from the distributed knowledge and actions of a group, I retain the idea of representation as a key in understanding how meanings arise for the participants. Representation in this sense is theorised from an embodied perspective and I reviewed the work of the experiential realists and Laurence Barsalou as they contributed in complementary ways to the understanding of meaning in embodiment.

The next chapter sets out my research questions in more detail in the light of this wide ranging theoretical discussion and sets out the methodological agenda that I follow.

5 Methodology

At the beginning of this study, I laid out two broad research questions which framed the thesis. These were, 'What is the nature of groove?' and 'How do musicians derive meaning from it?'

Before discussing the research methodology, I lay out two exploratory themes which have emerged from the theoretical review but need to be explored further through the data. With each theme, I introduce further targeted questions that will be examined in the data analysis.

These themes and their questions are:

1) The relationship of timing to groove

Do players' roles within the group have any impact on timing and groove?

Does groove emerge from a particular form of timing profile between players?

How do the verbal reports and timing data correlate, and how is this significant?

2) The relationship between structure and process in groove

Entrainment and cultural models have been proposed as accounting for groove; what part do they play in shaping the temporal relations within a group?

These themes and questions will be addressed over the second half of the thesis.

5.1 Overview of methods

The raison d'être for the methods used in this study was to overcome some of the problems that have occurred in existing studies of jazz and groove. These issues were referred to in the course of the preceding chapters and identified as follows:

1) a lack of ecological validity through not collecting data from real performance,

2) a focus on either timing **or** interview data without integration of these,

3) a tendency to theorise groove in terms of structure or process without recognising the dialectic between these elements.

To study timing data at the expense of studying musicians' feelings about these data, or to look at structures without paying attention to the way in which they are enacted seems to ignore the felt dynamics of groove. The complexity of groove is implicitly referred to by musicians through the varied ways in which they talk about it. The often nebulous descriptions that appear within the literature and within the data chapters of this work, far from pointing to a lack of articulate speech on the part of players, rather point to the need for researchers to broaden their methodological horizons in order to accommodate real world data. Whereas some researchers have argued that talking about music is a fundamentally flawed logocentrism (Seeger, 1977), there have also been more positive attempts to engage with the dialectic between speech about music and music. Feld sees in people's talking about music,

> 'an attempt to construct a metaphoric discourse to signify awareness of the more fundamental metaphoric discourse that music communicates in its own right' (Feld, 1994b, 93).

Feld argues that all sound events are 'entangled' in a 'simultaneous musical and extra-musical reality' (ibid, 84). The social character of music seems to insist on bringing words and sounds into an empirical encounter, however substantial the task may be in bringing these different dimensions together. My approach was to integrate two distinct research areas, the sounds of groove in performance and the musicians' understandings and responses to these sounds, into a single coherent analysis.

The sounds and the words came from a group of participants made up of three professional jazz trios. Audio and video data were collected from a live performance by each of the trios. These performances, recorded in three different jazz venues in the UK, were followed by a semi-structured interview of about one hour with each of the players; subsequent interviews were conducted with seven of the nine participating musicians at a later date[2]. In part, I chose this concise approach to data collection as a foil for the rather broad theoretical canvas on which the study was based. By limiting my research to three groups of three musicians, it was possible to collect a deep rather than wide set of data sufficient to answer questions about shared time and its meanings.

Once the data were collected, the performance and interview strands of data were analysed. Timing data were drawn selectively from the performances and through repeated listening and viewing of the audio/video data, I was able to focus on particular parts of each performance that appeared worthy of investigation and also viable as data. The commitment of the project to using real world data has resulted in an ecologically strong study but with that comes some of the difficulties associated with fieldwork - equipment and environmental problems that affected recording and so on. Thus the usable data represented a reduced subset of the total field data collected.

Once appropriate parts of the performances were identified, I began to look at the themes within the interview data and the timing profiles from the performance data. The theoretical theme of the project, examining groove as a form of intersubjectivity, was thus to some extent mirrored in the method, recognising that groove did not belong to either the objective timing measurements or subjective experience of the performers.

The nature of group interaction as the focus of the study presents another intersubjective element. Previous examinations of timing and groove (for example, Progler, 1995) have tended to look at timing relations but with reference to a temporal standard such as a metronome. Whilst this has some advantages in terms of control, the big disadvantage is the distortion of what happens in real performance. In the performance extracts within this study, we get a glimpse of the true relativity of timing within jazz performance. There is no perfect performance standard (such as a metronome or score) against which to measure the expressive deviations of the players. Standards emerge from the aesthetic judgements that the players made.

The extracts from the recorded performances add up to around 4 minutes of playing. While the extracts, therefore, are relatively short compared to the entire performances over the course of an evening, they yield prodigious amounts of timing data, and when set alongside the interviews with players, they form an extraordinarily detailed picture of musicians at work in the real world.

5.2 Preliminaries to data collection

The pilot project

Due to the complexity of data collection and analysis within the project, it was essential to trial these through a pilot project, supplemented by training in various technical specialisations. The full pilot project involved a literature review and enabled me to ask research questions that were relevant to the project proper but here I want to focus on the methodological value of the pilot.

To test the viability of my approach to data collection, a five-piece band was recorded at the Spin Jazz Club in Oxford in February 2006 [3]. The approach taken to recording was similar to that used for the main data collection – the band were recorded in audio using a ProTools recording setup and a single tripod-mounted video camera. Full details of the recording method are given later in 5.3. All the musicians were interviewed within a month of the performance using a semi-structured format.

The research theme of the pilot was to investigate the relationship between soloists and rhythm section players. It is not my intention to look at the results here but it is worth noting that this theme remained relevant to the main research project. Data in this project however was not taken from the pilot performances or interviews. My intention was to restrict my interest to jazz trios and this effectively ruled out the band from the pilot.

The single most valuable part of the test project was the opportunity to try out recording techniques, gain experience of interview techniques and test methods for processing and analysing the significant amounts of data that are yielded in the course of a performance.

In both forms of data collection, more important than results was the process itself. With any project that involves an element of field research, the preparation for recording the event(s) is crucial. Before the pilot study, I undertook training in camera-work and live audio recording techniques and a small number of gigs were also recorded prior to the pilot. Training, both informal and formal, was undertaken for the software used in the analysis of data such as Praat and Avid. These programmes will be described in more detail later.

Seeking participants

The participation of players in this study was guided by a number of factors. The first criterion for approaching musicians was related to the fundamental unit of investigation in the study which was the jazz group. In a previous study (Doffman, 2005), interview data was gathered from individual musicians on the music scene in London. The aim in interviewing a small number of bass players and drummers each with their distinctive approaches to timekeeping and groove was to create a broader backdrop to a quasi-experimental, quantitative investigation of timekeeping between a single bass player and drummer. The present project, with its emphasis on timing in real world performance and the meanings attached to 'being in time' together, required a rather different approach. The units of investigation within similar ethnographically motivated studies of jazz have ranged from a focus on individuals (Keil & Feld, 1994), through groups (Berger, 1999; Reinholdsson, 1998) to whole scenes (Jackson, 1998). The unit in any such studies can be taken to be the core object on which the study focus is trained; for this study with its examination of timed interactions between players, it made most sense to use the performing group as the central unit. Of course, to make sense of the unit, there is a need to look within it to the individuals that constitute it and

beyond it to the scene in which the group may be working. Nevertheless, it is the sense of the group at work in performance that was the central motivation for this study.

There were a number of dimensions to choosing bands for this study. The primary concern was that the bands would be available for both interviews and performances. As case studies, it was important to get as rounded a picture of each working group as possible, so musicians who were happy to be recorded in concert but not interested in being interviewed would not have been useful participants. As the project involved a relationship developing with a band over a period rather than just a single interview or concert, it was important for me to have all the band members 'on board'.

The degree to which bands were actively working was also important. Even the most enthusiastic participants would be of little use if they had no performance opportunities or were touring abroad continuously. The state of the jazz scene in the UK can mean that even successful bands work sporadically through the year, a state of affairs reflected in the relatively poor earnings of jazz musicians in this country (Riley & Laing, 2006). Ironically, greater success can lead to a reduction in engagements for some bands as they look towards greater financial reward and more prestigious bookings. Bands that are working frequently may be taking on small gigs that are relatively poorly paid but enable them to maintain some sort of profile on their local scene.

The size of band was of significance for the project. The recording of the band in the pilot showed up the difficulties inherent in live recordings, not least, the problems in separating the sounds of the various instruments for subsequent timing analysis. It was clear from that point that a smaller group could provide

equally significant data but with less noise spill from track to track and so I decided to focus on the trio as the most appropriate format for my research. The trio represents the smallest working unit within jazz that comprises a full rhythm section of bass, drums and piano (or guitar).

Although the age and experience of the participating musicians was not central, I was looking for a spread of levels of experience within the groups. The development and awareness of timing issues is for many players something that unfolds over a prolonged period and could play a part in my understanding of groove.

The extent to which I already knew the musicians was important in finalising the choice of participants. It would have been possible to work with participants that I played with regularly. There could have been some advantages to this strategy such as a pre-existing element of trust on both sides which may help in the quality of interview data. However, there were clearly problems associated with questioning colleagues known to the interviewer; not least would be the tendency for them to make assumptions about knowledge of their playing and so answers could tend towards the oblique. I decided that it was important not to have a current playing relationship with the participants. A long term acquaintance, as I had with one or two players did not however appear to suggest a problem.

Contacting musicians

My involvement with the jazz scene in the UK stretches back over 25 years and during that time I have had contact with a large number of musicians, either directly through playing or indirectly through their work profile; for instance, my awareness of many players is through their recorded output or through mutual

networks in which we both may share playing experience. That relatively rich level of potential contact with people in the community is a huge resource.

Once ethical approval for the project was gained from my institution, the first concrete step was to begin making contact with potential participants. In August 2006, I began the process, using the Jazz Services website [www.jazzservices.org.uk] as the first move in contacting leaders of trios – the website has the most comprehensive directory of jazz groups and musicians in the UK. I compiled a list of about a dozen potential trios, some members of which were known to me either because I had come across them as a player or knew them through mutual acquaintances.

At the same time, I phoned a small number of friends to get any ideas from them about trio musicians whom they felt might be interested in taking part in this study. A useful break occurred in early September when a musician friend suggested contacting Simon Purcell, Head of Jazz Studies at Trinity College of Music in Greenwich, London; Simon is an old friend from my playing days in London but I had not spoken with him for some years. I had mentioned to him that a spread of trios with different levels of experience would be useful and he agreed that the idea of a student band or bands within the cohort of participants seemed a good step in getting part of that spread.

Simon Purcell in turn gave me a number of contacts, mainly students who had just left or were in their final year at college, and so were actively playing in London at the beginning of their music careers. I began contacting some of these students. SC [4], a pianist who had just recently left Trinity, was very interested and we discussed recording a rehearsal and then the possibility of a gig later. He was working with two final year students at Trinity and within a few phone calls, we had established an understanding that his band would be involved.

At the same time, a colleague suggested I get in touch with JD, a trio bandleader who is also regarded as one of the top jazz pianists in the UK. I telephoned JD who responded positively but wanted to know more about the project. One of his legitimate concerns was the nature of the recordings that I proposed to make of his band's performances. Issues of copyright and control are rightly at the forefront of musicians' minds when recording is mentioned. With some reservations about recording issues, JD agreed to contact the other two players in his band to check on their feelings about this. JD had a national tour scheduled for October 2006, and there were possibilities for recording performances on that tour.

Part of my work as a musician involves running a jazz club in Oxford and this was a significant resource in encouraging players to participate in the project. It was also the way in for me to contact the third trio who agreed to participate in the project. The DC Group, a guitar trio, had already been offered a gig at the club; as an instrumental trio with a vocalist on some numbers, they fitted the template for the type of band that I was interested in. I knew DC, the guitarist and bandleader and had played with her many years previously in London. DC was very open to the idea of joining in the project.

By October 2006, the dates for recording performances of all three groups were put in place with interviews to be arranged for the early part of 2007.

None of the musicians participating in the project received any financial inducement to take part. If there were any incentive, it was the opportunity to get a good quality audio-visual recording which could be used in a number of ways – to be used as a promotional tool for getting work, as a practice aid (for most jazz musicians, the opportunity to watch oneself perform is limited) or as the basis for a commercially available product. One group, the DC Group, released an album from the recording made at their performance – an unexpected bonus for the

group and tribute to the recording skill of my colleague, Andy McGuiness, who operated the audio recording equipment that evening.

Contacting venues

The jazz scene in Britain relies on small independent venues usually run by teams of volunteers. These small performance spaces have become indispensable for the continuation of the music at a time when the opportunities for playing jazz appear to have become more limited. Many jazz performances take place in pubs, which are licensed for live music, either in separate rooms for the music or within the main body of the pub. The other staple venue is the small regional arts centre or theatre, which tend to be funded by local councils. In contrast to larger performance spaces which may well equipped with lighting rig, sound desk and an accompanying engineer, many venues have a rather rudimentary sound system with little or no stage lighting.

In negotiating to record performances by these groups, an added ingredient was seeking permissions from the various venues. From the point of view of the venue, an audio-visual recording set-up can be a distraction for the paying customers (all of the venues in which we recorded charged entry) and extra work for the promoter setting up the gig. However, all venues gave permission and were generally very helpful in allowing us to set up cameras and recording equipment within the audience space.

An advantage of being involved in running a jazz club is that it has given me continued opportunities to record performances from the pilot study through to the data collection period proper and in that time, allowed me to refine and better understand the recording process. A disadvantage in running the venue from

which some of the data was collected comes from the difficulties involved in trying to manage the club and also set up the cameras and audio recording equipment at the same time.

Types of performance to be included

In initial discussions with potential participants, I made clear that it could be useful to record both rehearsals and live performances. While all the musicians were happy to accommodate the recording of a rehearsal in principle, the reality was that, as bands and individual players develop their careers, the amount of rehearsing tends to decrease and so it proved difficult to arrange rehearsal recordings.

Within this group of three participant bands, it was only possible to record one group in a full rehearsal, the SC Trio. The DC group (guitar trio with singer) were filmed and recorded during a sound-check prior to one of the two recorded gigs. The remaining band, the JD Trio were recorded only in concert.

At the point of beginning to analyse data, I decided to use only extracts from the performances since rehearsal data was not available for all three groups.

Band style as a criterion for participation

Travis Jackson, in his exploration of the New York jazz scene, proposed a number of dimensions that make up a music scene. While the notion of a scene is often defined in terms of geography and history, Jackson is clear that scenes also comprise a stylistic element (1998). Although rather difficult to articulate, musicians can pinpoint their relationship to the whole of jazz through a sense of

their own style. This stylistic identity is established not just by using broad terms such as bebop, post bop, 'ECM' [5], but by association with particular players. Most jazz musicians will readily understand a guitarist's approach if they are described as for instance, 'Metheny-like' (Pat Metheny is an influential American guitarist). In this way musicians identify themselves as part of a particular scene.

With such a diverse palette of styles and scenes available under the term 'jazz', I had to make decisions about the degree to which my choice of band should be determined by scene and style. One approach in looking at time and groove could have been to compare representative bands from the traditional, mainstream, bebop, modern and free styles and this might have worked very well. Due to my own familiarity with the genre and the practicalities of getting musicians' participation, I decided at an early stage to focus only on groups within the loosely styled 'contemporary' scene whose performances were influenced by jazz from the 1960s onwards and whose rhythmic palette might include post-bop, latin and funk grooves.

5.3 Data collection

Much of the work done on jazz performance from an ethnomusicological perspective has tended to focus on the thoughts of musicians revealed in interview (Berliner, 1994; Monson, 1996 ; Reinholdsson, 1998). While the use of interview material forms a significant part of this project, the study is distinct from those mentioned above in its capturing timing data from live performances using audio-visual recording so that the performances themselves provide the central focus for the study and the musicians' own reports of playing provide insight into their

behaviours. The aim is to look at the words and sounds as they each provide triangulation points with the other.

List of participants and performance details

Recordings were made by myself and colleague Andrew McGuiness. Andrew took charge of the audio recordings and I operated the video cameras.

Band	Recording details
DC Group DC – guitar AR – bass BB – drums	1. The Spin Jazz Club, Oxford ○ Thursday 12 October '06 ○ Performance 2. The Vortex Jazz Club, London ○ Sunday 12 November '06 ○ Performance
SC Trio SC – piano SL – bass TS – drums AW – sax * ML – sax *	1. Trinity College of Music ○ Thursday 16 November '06 ○ Rehearsal 2. Oliver's Bar , Greenwich, London ○ Wednesday 17 January '07 ○ Performance (with ML on sax) 3. The Spin Jazz Club, Oxford ○ Thursday 18 January '07

* Guests with the band	○ Performance (with AW on sax)
JD Trio JD – piano AS – drums ST – bass	1. Brighton Jazz Club, Brighton ○ Friday 17 December '06 ○ Performance 2. Bonington Theatre, Nottingham ○ Thursday 7 December '06 ○ Performance

Table 1. Summary of recordings.

Audio Recording

Performances were recorded into ProTools 6.9 on a laptop via a Digidesign 002 rack-mounted audio interface with an auxiliary Focusrite Octopre audio interface, expanding the audio input capacity to 12 channels.

The precise configuration of microphone and direct line outs from the instruments varied to some extent from performance to performance dependent on instrumentation. The choice of microphones also changed as we experimented with different combinations. However a typical stage set up was as follows:

Drums:

Bass drum: AKG D112 (dynamic cardioid).

Snare drum: AKG C418 – pp (dynamic hypercardioid).

Overheads: 1 Matched Pair x AKG C414 (condenser).

Piano:

Either 1 Pair of Neumann KM 184 (condenser cardioid) or AKG C414 (as for drum overheads) for acoustic piano and direct input from electric keyboards.

Guitar:

Shure SM 57 on speaker cabinet.

Bass:

Direct input from bass amplifier and AKG C1000 on speaker cabinet.

Placement of microphones

Microphone placement has a significant effect on sound quality and separation in a live recording environment. Whilst it was desirable to get a good sound quality, the key aspect of the recording was to get as good a separation between instruments as possible to facilitate subsequent audio analysis.

There is no conflict between quality and separation with direct line recording from amps, but with microphones there are no precise rules for achieving a good compromise between the two. Therefore, there was considerable experimentation from gig to gig with what might work. Inevitably that caused some slight fluctuations in both quality and separation as different combinations of microphone and their placement were used.

Examples of different set-ups included

- For upright piano: microphones placed either at the rear of the soundboard at either end (SC Group at Oliver's, London 17 January 2007) or placed to the top front of the soundboard, with the front casing of the piano removed,

facing the open strings from both ends (JD Trio at Brighton Jazz Club, 17 November 2006).

- For drums: two set-ups were used.
    - A standard 4 microphone set-up of 2 overheads, with bass drum and snare drum microphones.
    - A trio of microphones, 1 on the bass drum, 1 overhead microphone hung vertically over the snare at a little over head height and 1 overhead microphone facing horizontally into the kit from beyond the floor tomtom.

Video recording

The optimum video set-up [6] involved two Sony PD 170 video camcorders recording to portable drives and/or DVCam tapes. One was set up as a fixed camera mounted on a tripod and the second operated as a movable camera from a tripod. The combination of one fixed and one manually operated camera allowed me the opportunity to catch the entire band from one position and also to focus on particular players during the course of the performance. Ideally, the cameras were set to left and right of the stage area. Both cameras had mounted rifle microphones which were used to assist in editing; sound quality was insufficiently high to be used for sound analysis itself. Post-performance, tapes were captured by tape deck and hard drive recordings transferred by firewire into an Avid workstation [7]. Once stored within Avid, the performances were available for editing and transfer to DVD. After being transferred to DVD, copies were sent to the musicians. There was a two-fold purpose in sending copies of the recordings to

players. Firstly, to give them a record of the performance to which I planned to refer during interviews, and for them to have a record of their gig for their own use. A DVD of the relevant performances is enclosed with this study (track listings on page vi).

Interview data collection

Musicians	1st Interview	2nd Interview
DC Group		
DC	12th January '07, London	2nd July '08, London
AR	12th January '07, London	30th June '08, London
BB	16th January '07, Halstead, Kent	2nd July '08, London
SC Trio		
SC	12th April '07, London	30th June '08, London
SL	12th April '07, London	No second interview
TS	12th April '07, London	No second interview
JD Trio		
JD	9th January '07, St Leonards	11th June '08, St Leonards
AS	12th January '07, London	7th July '08, London
ST	16th January '07, London	2nd July '08, London

Table 2. Summary of interviews.

Interviews were conducted in two rounds. The majority of the first round of interviews were conducted in the first two weeks of January 2007. The seven interviews in this period were with the members of the DC Group and the JD Trio. A further three interviews were completed, in April 2007, with members of the SC Trio. All but two of the participants responded to my request for a second interview in 2008. The second round of interviews all took place in June and July 2008.

The interviews were all conducted at the homes of the musicians and were recorded in audio onto a portable MP3 player with a built in microphone; a simultaneous recording to a Tascam DAT recorder was made as back-up. The length of each interview varied but all were between fifty and ninety minutes in length. Videos of the performances were played to the interviewees on a laptop computer with external portable speakers.

Interviews

Interviews followed a semi-structured format for each musician. The questions were substantially the same for each player with some allowance for individual circumstances. The questions and formatting protocols for citing the interviews are outlined in appendix A1.

To assist in the musicians' remembering details of their performance, all interviews included my playing extracts from the video recording of each performance to the players and recording their responses to the extracts.

The second round of interviews was conducted in the final months of the project once the majority of the performance data analysis had been made. Although conducting interviews late in the life of the project had the potential to delay the completion of the project, I felt that the benefits outweighed any drawbacks. Firstly, it allowed me the chance to go back to each of the musicians with more focused questions. In particular, I used the extracts which formed the bulk of my timing data as the springboard for more targeted questions. I was able to lead the musicians back to a small window within the performance and ask questions directly tied to the extracts.

In this second round, I followed a looser interview structure than in the first. I began each interview picking up on points that these musicians had made in the first interview that were unclear or would benefit from expansion before referring to the video extracts.

The other benefit to a second round of interviews was my sense that the musicians were more open and felt more comfortable about answering my questions. More than one musician in the first round of interviews mentioned their nervousness about having to talk about their performances and their work. Interestingly, any reticence was largely about whether they had anything interesting to say about their playing. In the event, I was not aware of any musicians feeling awkward as they got past their initial nerves about being interviewed.

Two of the musicians were contacted by email for minor clarifications and their replies, where used, are dated by receipt of their email.

5.4 Data Analysis

Audio data analysis

With the recorded data ready for the initial stage of analysis, the next step was to begin to make choices about which parts of the performances would be suitable for analysis. This was a heuristic process. The criteria for further analysis included an assessment of musical congruence for the project and the clarity of the recording.

Through repeated listening and viewing, I began to develop an idea of which parts of the performances would fit into the overall aims of the project. It is at this point that the 'real' in real world performance becomes a more complex term. Clearly, the selection and editing of raw material has an impact on the ecology of the project. Although my selections may speak of a covert authorial presence, they were a vital part of the data analysis process. Without some refining of the massive amount of performance data, I would have been unable to present a coherent picture to the reader.

The criterion of congruence recognised that there needed to be some commonality between the performance extracts. At different points in the performances of the groups, the temporal styles of the three groups differed hugely; the differences could be in metre, tempo, swung or straight eighth note subdivisions, genre (funk, latin, jazz and so on). It became clear that some extracts would be more valuable in answering my research questions than others and so I finally chose three extracts which had these shared profiles:

- all excerpts featured the leader of the group as soloist
- all excerpts featured walking bass lines and other key elements of jazz performance such as an appropriate ride cymbal pattern
- all were understood to be 'jazz' by the performers (as opposed to, for example, playing a funk groove)
- all were played in a 4/4 metre

Even with sophisticated live recording equipment, it can be difficult to record instruments without some spill from the other players. For any instruments recorded with microphones (as opposed to those that used direct input), this

resulted in some degree of spill from the other instruments. If the individual tracks contained too much spill, then this could render the analysis problematic or impossible due to the degree of unwanted noise on the track.

Praat analysis

With all the performances recorded using separate tracks for each instrument, the tracks recorded in ProTools were then imported into Praat software as *.wav* files.

Praat was initially conceived as a phonetics programme but has more recently been used in musicological research. Measurement of timing patterns in instrumental music is in principle no different to phonetic analysis and faces many of the same issues as measurement of speech. Praat offers a sophisticated range of analytical tools for acoustic measurement. The user interface is relatively open, leaving the researcher many options within the analysis. In addition, Praat offers its own programming facility in which 'scripts' can be written and then run on files. The results of any data sets can be easily exported into a spreadsheet such as Excel.

Below is a sample analysis window from Praat showing the waveforms, spectrogram and labels for four onsets from a bass track.

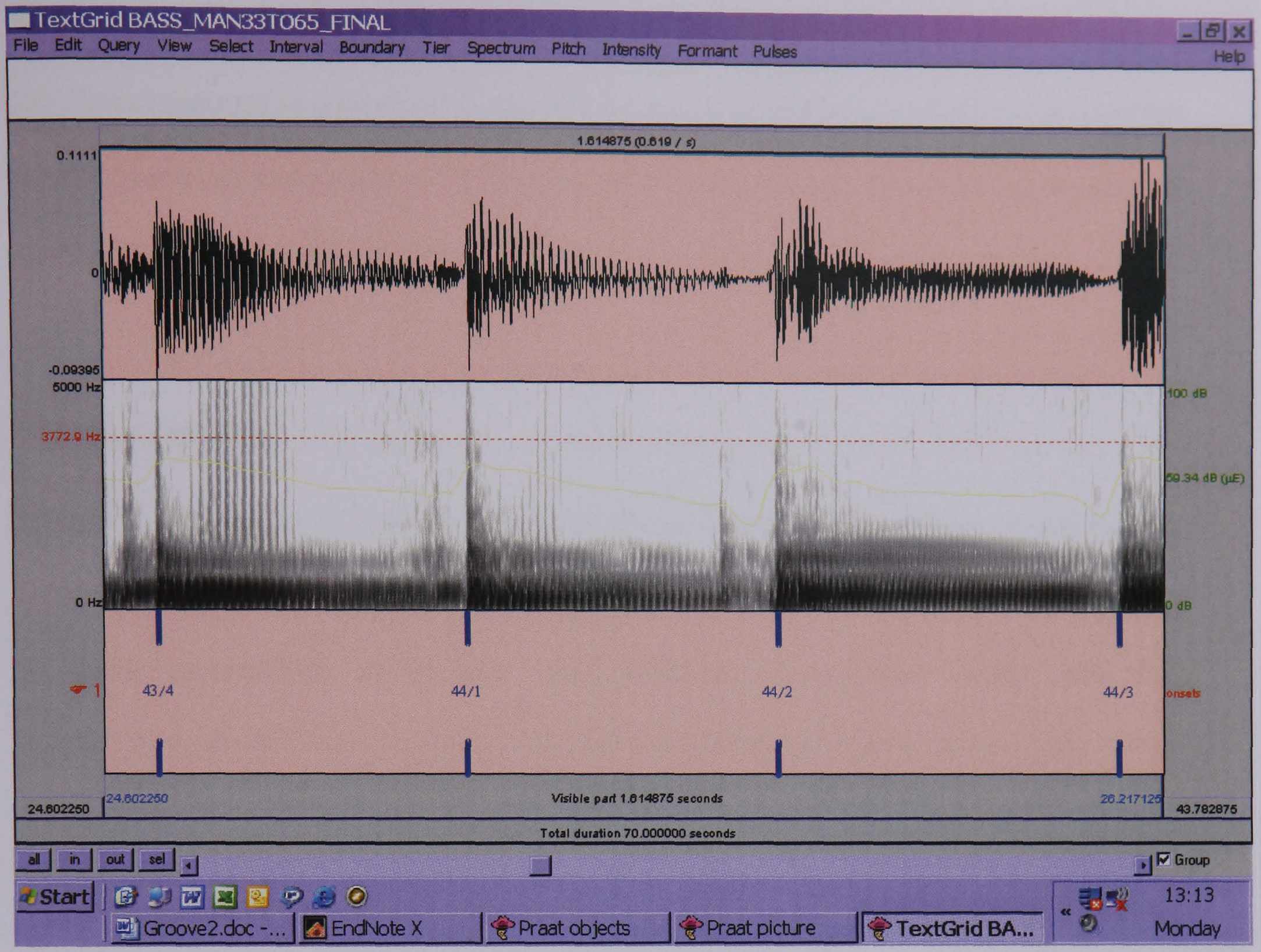


Figure 1. Praat Analysis window showing a segment of a bass line imported from a ProTools track.

This screenshot of the Praat analysis window (Figure 1) shows four quarter notes taken from the bass line in 'There is no greater love' from the SC Trio performance. The Praat analysis window is divided into three horizontal segments. The pink shaded segment in the topmost third shows the waveforms of the bass and indicates the moment of onset for each of the pictured quarter notes. In the middle segment, Praat displays a spectrogram. This displays the energy of the sound at different frequencies, darker areas representing the most energy. The yellow line running over the spectrogram shows the overall intensity (in dBs) of the sound. Both these screens are automatically generated once a sound file is read by Praat.

The bottom third of the screen appears blank when Praat first displays the sound file. This segment is provided to accommodate any labelling that may be required in the course of the analysis. In this screenshot, four quarter notes were labelled starting from beat 4 of measure 43 [8].

Onset Detection

Detecting the onset of a note is fundamental to timing analysis in music but its detection is acknowledged to be methodologically and theoretically complex. Two separate approaches were tried out. Although in practical terms, the two approaches yielded not dissimilar outputs, the theoretical justifications were rather different.

The first approach, using a Praat script developed by colleague Andy McGuiness, was designed to search for the perceptual onset of each instrument understanding that to be roughly analogous to the steepest point of the intensity slope for each instrumental attack.

Within the auditory processing literature, the notion of perceptual onset or perceptual attack times have become important, if rather penumbral concepts, in

> 'synthesising perceptually accurate musical rhythms, for measuring the rhythmic precision of a musical performance, or as an aid in constructing various psychoacoustic experiments related to rhythm or time perception' (Gordon, 1987, 88).

Perceptual onset time refers to the perceptual moment of occurrence and is co-terminous with 'perceptual centres' or P-centres, a notion developed within research on speech processing. It was discovered that although a spoken sequence of syllables may be isochronous in production, their perception by

subjects was an-isochronous; for a not dissimilar account of perceptual synchronisation in the timing production literature, see Aschersleben (2002). This suggested that physical onsets have no simple perceptual correlative. As Scott has made clear, P-centres can only be indirectly measured and although their psychological reality is confirmed by a wide range of experimental data, their existence can only be inferred as there is no sound for which there is an absolute p-centre value (Scott, 1998).

The difference between perceptual onset and physical onset becomes more critical as the length of instrumental attack increases. The rise times of bowed instruments and woodwind instruments are longer than those for percussive sounds where the attack is short. In such cases, the perceptual moment may be up to 10-20 ms after the physically created sound. Perceptual onset thus becomes more critical as a marker as instrumental attack becomes more diffuse.

While the notion of a perceptual compensation for the differing attacks of sounds is important for modelling how timing is integrated, there are difficulties in basing measurement of the real world sounds of this study on this construct. As a method, it could be useful if the participants in this study were also subjects in an experimental setting to determine how each perceptually coded the physical onsets of the sounds. However this was not feasible within this project.

It seemed more reasonable in the light of the indirectness in measurement of perceptual onsets to take the physical onsets of each instrument as the basis for any timing data, so shifting the emphasis from percept to product. Making the physical onset the basis of timing accords more with the overall aims of the project which is less concerned with the perceptual context of playing in time and more with the interactive behaviours of the musicians whose relative measure can be equally judged through physical onset.

The physical onsets were judged in a two step process. Firstly the McGuiness script was used on the wave files to assign onsets to notes. The script could be modified through a series of parameters. These parameters consisted of an intensity threshold of onsets in dB, a high pass filter and triggers for searching for onsets. The parameters were manipulated in a heuristic process for each instrument to the point where the script would pick up the required onsets. When the parameters of the script were judged to be effective for identifying relevant onsets, then the script could be tested and the parameters changed accordingly dependent on the script's success in identifying the onsets. Once the sensitivity of the parameters was set correctly, then the script could identify physical onsets and place markers in the labelling window of Praat. No running of the script produced a 100% success in identifying onsets and placing markers at the physical onset point. Each script result required some manual tuning; some scripts yielded false onsets or did not pick up the onsets of performed notes that were clearly visible in the Praat waveforms and some onsets required recalibrating to ensure consistent placement across all performances.

Once the onsets were judged to be accurate in capturing the relevant rhythm events and consistent in finding onset points for those events, then a rhythm transcription of the track was created in Sibelius [9]. The rhythm transcriptions were carried out either in Praat or in Transcribe, a commercially available software tool that assists in transcription through its ability to change pitch and tempo for a given wave file. A notational code was added to the Praat text grid (as indicated in Figure 1, above) to correspond to the Sibelius transcription; in this way, the raw timing data could be transferred to Excel with accompanying notational data. While it was important to be accurate in the transcription, it was not necessary to transcribe all that was played in the extracts. For the piano and drums, the leading

hand of the player was transcribed with the understanding that the leading hand will generally be the most consistent, and on drums, I restricted the transcription to the ride cymbal as this is regarded as the timekeeper by most jazz musicians. The process of transcription is of course central to the analysis. Once again, the process was heuristic. Firstly, multiple listening of an instrumental track allowed me to build a mental picture of the rhythmic feel; at the same time, I produced a numerical timing grid showing the mean timings for quarter, eighth, twelfth and sixteenth notes and with this grid, it was possible to gauge my intuitions of rhythmic patterns against an objective template. In one case, I went back to the musician to ask their opinion about a part of the transcription of their performance.

Once an onset profile had been created for the performed extract, then the Praat text grid file containing the absolute timing data and notational code was exported into Excel. A number of macros were written in Excel to assist in the conversion of absolute times to other relative data such as interonset intervals for individual instruments, relative asynchronies between pairs, relative mean timing between the trio of instruments, all of which were then used in the analysis. More detail on these conversions appears as they are brought into the timing analysis in Chapters 6 and 8.

Interview data analysis - nVivo 7 and manual coding

In total, 19 interviews were undertaken through the course of the project (not including interviews as part of the pilot study which have not been used in the main body of the project). Each first round interview was transcribed following the formatting protocols used by other members of the EMMP Project [10]. Once transcribed into MS Word, and after an initial manual coding, each interview was

then imported into nVivo 7, a qualitative analysis programme. nVivo provides a software environment for handling and coding qualitative data and enables ideas and themes that emerge from the data to be held within a single framework.

Prior to using nVivo I undertook an initial manual coding of themes within the interviews for one group, as a starting point for examining emergent themes. Each interview was first coded for salient points on virtually a line-by-line basis. At the end of this process, which yielded a large number of summary points for these interviews, I went back over these points and colour coded these into themed sets.

For the first trio interviews, I then wrote an analysis of the interview data for each musician. The other trio data were then examined in the light of the themes emerging from the first group. This was to speed up the process of analysis and to get an initial rough set of themes. Having done this, I then put the interview data into nVivo for a second round of coding; this was more detailed using a hierarchical coding structure with six root headings – Communication, Groove, Timing, Songs, Players, Soloist and Rhythm Section – from which were derived multiple branch codings for each of these basic headings. These root headings were derived from the initial manual coding but had evolved as my sense of the importance of particular themes changed.

The approach shared some commonality with grounded theory approaches to qualitative data (Charmaz, 2006) – a concern to allow the themes to emerge beginning with a line by line breakdown of the data. However, there are some important differences. Firstly, it was my aim to look at the interview material from the start as a point of triangulation for the timing data so there was no blank slate in approaching the material. Also in contrast to true grounded approaches, my theoretical perspective, using entrainment and cultural model theory was already developing in tandem with the ideas emerging from the data. Grounded theory

would normally insist on a theory emerging solely from data with any literature being reviewed after the theoretical picture had emerged.

Video data

The use of video data in this study has largely played a supporting role to the analysis of interview material and performance extracts. Video data were used extensively in the interviews to assist musicians' recalling their playing in the performances and were crucial in my selection of extracts and my choice of particular questions to ask in the interviews.

Video material was used in my analysis of the bodily enacting of temporal models by the players. The material here was used to illustrate the role of the body in players' articulating particular models but was not intended as an analysis of body motion involving detailed timing descriptions of the movements.

5.5 Performance excerpts – an introduction

The temporal data for the analysis that follows over the next three chapters was taken from short excerpts from performances by each of the three trios in this study. These were recorded in two jazz venues in London in December 2006 and January 2007 respectively and a Nottingham venue in December 2006 (venue details were outlined in 5.3).

From each trio, I took one solo played by the respective 'lead' instrument (piano in two of the trios and guitar in the third trio) to supply the data for my analysis. Over the next three chapters, in the interests of clarity, I always refer both to the song

title and the group when prefacing each part of the analysis. Below is a brief introduction to the three pieces of music that contributed the temporal data, outlining the temporal style and structure within each piece.

The accompanying DVD (track listings on page vi) includes each of the extracts from which the timing data was taken and each of the pieces in their entirety.

SC Trio - 'There is no greater love'

This extract is taken from a performance by the SC Trio playing with a guest saxophonist at a small London venue which was frequented mainly by students at Trinity College of Music. The excerpt is taken from the jazz standard 'There is no greater love' (Symes and Jones), which follows an AABA form of 32 measures. Whilst standards do get played in a variety of tempi, this particular piece is generally played at slow to medium tempi and the SC Trio follow that accepted practice in this performance, tending towards the slower end of the spectrum. The analysis is taken from the piano solo which continues for two choruses.

Played at a medium slow tempo (c.124 bpm), with a walking bass line, the playing style speaks of mainstream jazz in a more direct way than the other two excerpts. In particular, the drums plays with a strong '2 and 4' feel for most of the solo, largely conveyed by the hihat and snare [11]. The ride cymbal pattern would be described as 'semi-broken' in that it largely adheres to the standard jazz ride cymbal pattern but deviates at some points (Riley, 1997). The bass line is played in the conventional 'walking' pattern with some embellishments in the form of triplets and offbeat swung quavers. The piano solo is constructed largely round a swung feel with considerable use of triplets and some passages of sixteenth notes.

DC Group - 'Slippers'

The DC Group excerpt comes from an original composition by the guitarist and leader of the group. The performance took place at the Vortex, a well known London jazz venue at the end of a short tour by the group which took them to jazz clubs throughout the UK.

This excerpt comes from a piece called 'Slippers' and is a 64 bar guitar solo; it is played at a moderately fast tempo (around 234 bpm) in 4/4 metre. The harmonic framework is a simple four measure alternating pattern between Dm7 and Dbm7. The overall style of the excerpt suggests a contemporary take on jazz; the guitar sound acknowledges fusion rather than straight-ahead jazz and the drummer's playing similarly has a contemporary feel making use of a melange of playing styles which subtly move the feel towards funk as well as modern jazz drumming. In particular, this is achieved by the implied half-time feel of the drums at certain points in the performance through a strong snare accent on beat 3 and this is set against the jazz feel supplied by the hihat on beats 2 and 4. The ride cymbal is played with a 'broken time feel' [12] which is designed to complement and interact with the soloist in a much more active way than more traditional drumming styles. The bassist plays a walking bass line, the prototypical bass figure which marks out all four quarter note beats in each measure and this is played throughout the whole excerpt.

In contrast to this extract, the rhythmic form of the remainder of the composition follows anything but a conventional jazz format. The guitar solo with its 4/4 jazz feel appears in the middle of a piece which is largely in 15/8 and played with a straight eighth note funk feel. The guitarist/composer cited the work of the British bassist, Dave Holland, as an influence in the writing of the piece.

JD Trio 'Evidence'

The third excerpt features the JD Trio playing a Thelonious Monk (1917-1982) number entitled 'Evidence', a piece which is based on the chord changes of a jazz standard entitled, 'Just You, Just Me' [13]. The piano solo featured in the excerpt is the only solo on the number. In this concert, 'Evidence' formed the middle section of a medley of Monk pieces including 'Trinkle Tinkle' and 'Four in One'.

The work of Thelonious Monk occupies a rather different niche within the jazz canon to the show tune repertoire that makes up the bulk of the jazz standards heard in contemporary playing. One of the great iconoclasts in jazz, Thelonious Monk is known for the strong angular melodies within his compositions, often framed in rhythmic bursts. For many musicians, a tune such as 'Evidence' is rather more compelling to play than a highly conventional standard. In this arrangement, pianist JD had altered some of the harmonic changes from the original [14].

This piece is played at around 240 bpm and rather faster than the typical tempo at which 'Evidence' can be heard from recordings. The overall mood of this excerpt, taken from the piano solo, is rather fractured before it settles into a more obvious jazz feel. AS, the drummer plays not only a broken time feel on the ride cymbal but also introduces numerous polyrhythmic devices, as does the bass player.

5.6 Summary

As the data collection and analytical methods used in this study are quite involved, I have gone into some detail about the ways in which these have been set up. With these methods articulated, I move onto the analyses and discussion of the performance and interview data, set out over three chapters.

6 Three trios - being in time together

Up to this point, I have laid out a broad theoretical framework for understanding groove built on two distinct areas of sharedness – a primary intersubjectivity that can be understood in terms of entrainment between players and a secondary intersubjective realm which is understood through the notion of cultural models. Over the next three chapters, I discuss the results of my performance and interview data incrementally. Over these next two chapters, I go through the elements that are critical to the establishment of groove but are not sufficient in themselves as a full description before moving to a full examination of groove in these performances in Chapter 8.

My approach in this chapter is to investigate the idea of time as a fundamental component of the jazz aesthetic and part of the underpinning of groove. I explore the players' performed time and their attitudes towards timekeeping and its development.

The chapter proceeds through three stages. Firstly, I view timing at the level of the individual player and provide an overall profile for each musician by looking at their temporal variance. I then examine a second level of timing and time awareness. That is the degree of coupling between pairs of players, often expressed by players as the feeling that they are in a spatial/motional relationship with one another. This moves the analysis in a more complex direction towards the idea of musical entrainment and this is explored through the underlying phase relationships between pairs of players; such pairings are expressed not only

through the timing data but also through the musicians' understanding of their roles. Jazz musicians, since the beginnings of the music, have understood some form of axis lying between soloist and rhythm section and attitudes to musical time can and do differ according to players' musical role within the trio. A more nuanced perspective emerges on temporality in performance as players reflect on their playing through an understanding of their purpose and their authority on the bandstand. The entrained behaviour that underpins groove can be seen to emerge not only from sensori-motor skills but from sense of self and others – a performed intersubjectivity. Thirdly, I look at the overall tempo stability of each group in these performed excerpts as the musicians discuss the aesthetics of tempo in jazz.

6.1 Time and timekeeping for jazz musicians

A well known musician on the London jazz scene once quipped, 'Billy Cobham [15] is the greatest drummer in the world; they timed him.' This aside was not so much a dig at Billy Cobham but rather a wry observation that musicianship cannot be reduced to numbers and that this is precisely what many critics, audiences and musicians do. The jazz aesthetic, in a manner not so different to other art worlds, involves a complex interplay between valuing emotional vulnerability in musicians and at the same time requiring that any such vulnerability be framed within overt technical prowess and distinction, a form of invulnerability.

Within the community of jazz musicians, a central part of the sense of self and others lies in the respect for musicianship; the ability to improvise fluently, to read well, to play in different time signatures, and to keep good time. All these attributes are held up to be central to the art.

Timekeeping and its development

The musicians in this study spoke of the ways in which they had developed their timekeeping. All of the players in the study had felt the need to work on their timekeeping. Some players felt lucky in their possessing a naturally good sense of time but no-one considered that this was sufficient.

TS spoke of always having been able to discriminate between a sequence of notes that was steady or drifting away from isochrony. He could hear, for example, the inconsistencies in other players' count-ins to tunes,

> 'if someone went 1……2….3…4, [*mimics someone speeding up as they counted*] I'd go 'okay, you're speeding up', and if I was counting something in, it would just be the correct thing to do to go 1 2, 3 4 so it was just obvious to me, without sounding pretentious…' (12.04.07).

Another drummer, BB, commented that

> 'I think I do have a natural sense of time which, I dunno how you can explain that, but even somebody with naturally good time, I think needs to practise it as well and work on it to be , to be you know really comfortable with it' (16.01.07).

The ways in which these players worked on time varied considerably. BB spoke at length of his dislike of working with metronomes. While he had used a metronome over the years as an aid to developing consistent time, he commented that,

> 'I find practising to a click [*metronome*] dreadfully dull, you know; it's just so unmusical so what I started doing was putting loops together and sampling things off CD's…so that I'm practising with something that is perfectly in time but it's also music' (16.01.07).

The dissatisfaction of playing to a click points to the need to develop practice routines that in some way resemble performance conditions; there is an attempt here to close the gap between practice and performance and reduce the less musical aspects of much musical preparation. BB required a more sympathetic partner for his practice than the overtly mechanical sound of the click. Some of the CDs used were recordings of bands that played without drums, thus providing a closer fit to his own real world playing – he became the drummer on those CDs.

Practising to a consistent pulse is not simply however about sticking to the click, or album track as closely as possible. One of the ways in which BB developed his sensitivity to the inflections of microtiming was in seeing how far he could push or pull away from the given pulse without losing coherence. As he said, 'if you've done a bit of that work, when you come to doin' it in the performance situation, you've kind of got something to work with…' (16.01.07).

Most of the other players had worked with metronomes over a considerable period of time. A common practice routine involved hearing the metronome as though it were on beats 2 and 4; most of the musicians cited the importance of working to a metronome on these beats. Jazz musicians' understanding of the importance of 2 and 4 has already been mentioned in 4.4 with reference to Zbikowski's analysis of groove and this timing model will be further explored in the next chapter. For now, it is sufficient to acknowledge its importance in so many jazz players' development.

Time development for some players, however, was not just about formal practising on one's instrument with a metronome. For two musicians, singing was seen as a crucial way of developing a solid sense of rhythm and time awareness. AS spoke of singing being,

> 'a very important part of it because… after you sing for a while, the rhythm sits down quite a lot more solidly in you so you feel the rhythm much better…and I've done that quite a lot and still do…' (12.01.07).

For DC, the development of her timekeeping followed on naturally from being in challenging playing situations in the early years of her career as a rock guitarist,

> 'I can remember going into a studio with an early rock band and finding it really, really hard and I think for a lot of young musicians, it's being recorded for the first time [and] suddenly all your tuning and timing problems are thrown right back onto you' (12.01.07).

It was from those sorts of early experiences that she began to reflect on her time and work at it in a more structured manner. For ST, the sense of developing one's time involved not only working on metronomic time but also a less definable quality which may be seen as the communicativity of one's playing, perhaps its authority. In his words,

> 'it is something I have worked on; it's an interesting thing because obviously there are lots of ways of breaking up the concept of time in music; there are two concepts – the strength of somebody's time feel in the way that they play but then the sense of tempo is different as well' (16.01.07).

By this, ST meant that it is possible to play with an infectious feel but this may not be always allied to an equally stable sense of tempo; alternatively, a well maintained tempo may not always be communicated with the required intensity – it might be technically correct but doesn't appear to engage others. Once again, the idea of 'good time' has a strong social component in the sense of a communicated self-confidence – playing time that is contagious. This communicated self-confidence may not always be justified; ST went on to comment that early on in his

career, having come from a rock background, his tendency was to drag the time back too powerfully. Within a rock context, this tendency to sit back on the beat is commonplace, but within jazz, ST felt that there has to be 'some forward motion…some sort of feeling of propulsion and it's surprising how far ahead you can go without speeding up…' (16.01.07). While his timekeeping was adequate in terms of tempo stability, when he crossed over from being a rock musician to jazz musician, he was confronted with the need to change the communicated feel of his time as he began to work with more discerning musicians.

Speeding up and slowing down are both generally undesirable within the temporal aesthetics of jazz and there is an acute awareness on the part of some performers about their tendency to go in one direction or the other. Drummer, TS remarked with candour about his performances within the study, saying,

> 'I know that my time isn't necessarily consistent, and it's not consistent in some of the videos, it's not consistent in some of the recordings, I mean it's alright, it's not really bad. I know when things can affect my time….if I start feeling boxed in, then I start pushing a bit' (12.04.07).

For other musicians, the tendency to speed up or slow down was seen as an overall condition within their playing, for example, ' I say my tendency would be to speed up' (12.01.07) was the comment of DC and she went further by speaking of how difficult it was for her to play with musicians who tended to drag back,

> 'I know 2 or 3 people who slow down and I find that really, really hard myself. I think most people do cos there is a natural tendency in music…I think they probably work so hard not to, you know, to sit on the beat, sit on a metronome thing whatever it is' (12.01.7).

For her, the speeding up was seen as very common in musicians and an almost natural tendency. In contrast, her view of players who tend to slow down was that this came from an over-zealous feeling of not wanting to accelerate, and consequently doing the reverse.

For musicians who had worked and continued to work in different musical genres, there is an additional dimension of understanding – how the different use of tempo and playing position relative to others is an important feature of style. Drummer, BB, had considerable experience of Russian and Slavic music in which the temporal aesthetic would often be expressed, not through a commitment to isochrony, but to various forms of accelerando and decelerando.

As with the degree of desired isochrony, so the degree of synchrony within genres of music may vary according to the diktat of the music's temporal style. In his study of participatory discrepancies between bass and drums, Progler (1995) makes use of a graphic display illustrating the degrees of being ahead or behind the beat that may be used in the generation of particular moods in contemporary popular music.

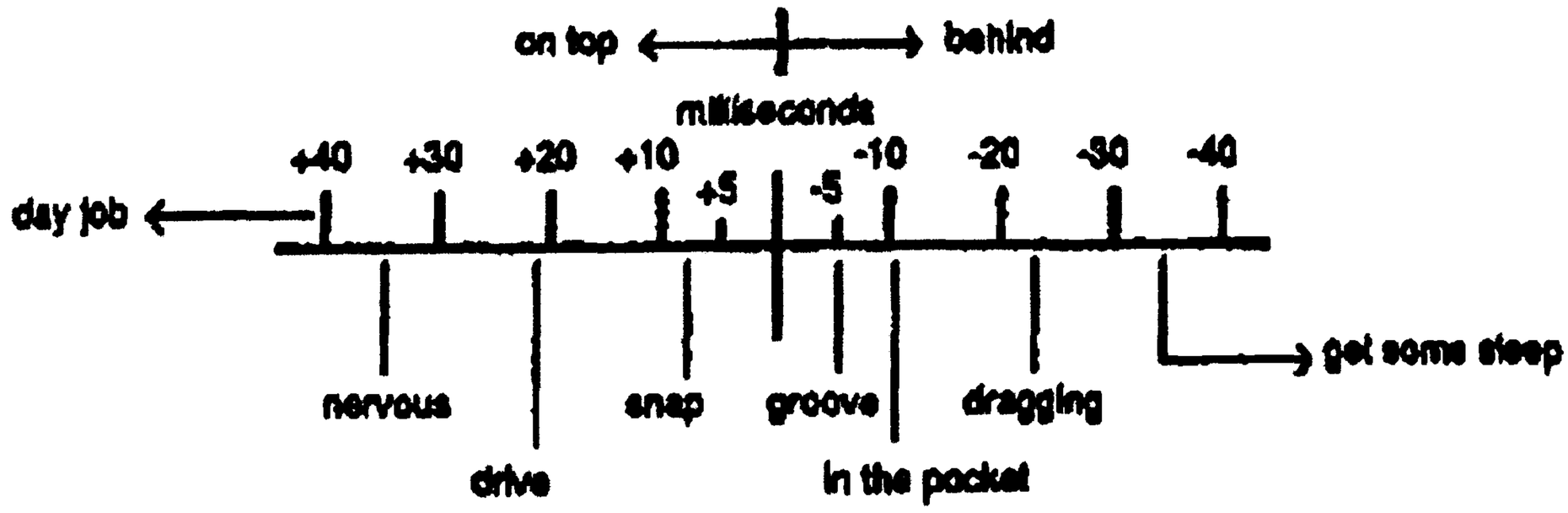


Figure 2. Michael Stewarts' feel spectrum reproduced from Progler (1995).

The slightly tongue-in-cheek mapping of different time feels in Figure 2 disguises the seriousness with which music producers have approached time feel within the last twenty years. For my purposes, the above illustration not only confirms the importance of timing as an affective device in the musical economy but also shows how synchrony between players may have rather different bandwidths for different styles of music. In this figure, the overall acceptable bandwidth of being ahead or behind is suggested as being around 45 ms in relation to a click track [16]. The aesthetic of musicians involved in studio work is governed to a great degree by the requirement to be extremely accurate - 'tight' in musicians' parlance - and this aesthetic of playing accurately is as much tied to economic concerns as sound. As will be shown in this chapter, the acceptable latitude for timing within jazz playing is considerably greater than is the case for much pop and dance music as suggested by Stewart.

While 'being in time together' as a fundamental part of performance is taken for granted by musicians, this chapter examines the way in which the musical fact of being in time is full of nuances for the performers. Even from the few musicians' comments above, one quickly gets a picture of a concern for performance standards, responsibility towards other players and an acute reflexive gaze on one's own playing. The above comments of the players suggest that the temporal issues involved in playing jazz can never simply be judged in terms of seconds and milliseconds as Stewart's diagram suggests.

Although the following timing profiles of the various players say something significant about each player's tendencies, these objective measures need to be framed by the meanings that the musicians themselves attribute to these nuances. For example, it may or may not be the case that consistent timing patterns are indicative of superior playing skill, but such data needs to be triangulated with

musicians' sense-making of their musical behaviour. What the following timing data can do in conjunction with the players' reports is to give an extraordinarily detailed outline of a performance and how their sense of their own time relates to their role.

In the analyses that follow, both the verbal reports and the detailed timing data are integrated to develop a sense of musicians at work and how the temporal aspects of their work are significant for them.

6.2. Analysis of individual timing profiles

Interonset intervals

The interonset interval or IOI is defined as 'the time from the start of any note to the start of the next note in the same part' (Clarke, 2004, 80). Interonset intervals (IOIs) can also be used 'vertically' to measure the asynchrony between notes in different parts at a particular point. Here I employ IOIs 'horizontally', as Clarke defines them, to describe the time between the onset of a note and its consequent and so the IOI becomes the basis for measuring successive temporal change per player.

In the extracts used within the data analysis, I have measured only the IOIs of on-beat quarter notes simultaneously played by all three musicians and used these as the basis for comparison. This has been done for a number of reasons. Firstly, the walking bass line, which is arguably the most important point of reference for the musicians, is played almost entirely on on-beat quarter notes; to use, for instance, off-beat notes would have effectively barred most of the bass onsets. Secondly, the majority of notes on bass and ride cymbal are played on the quarter note thus providing more data points overall. Thirdly the on-beat provides arguably the most stable point of comparison between players (Keller & Repp, 2005).

For the following sets of descriptive statistics showing mean and Standard Deviation for each player in the three trios, IOIs were normalised. The normalising of IOIs is a means of reducing different categorical durations, in other words, varying notatable note lengths to a common standard for easier comparison (Clarke, 2004); in effect, normalisation in these extracts is a means of imagining the played events as all being quarter notes [17]. Thus it solves the problem of comparing data from different note values.

SC Trio - 'There is no greater love'

	N	Minimum	Maximum	Mean	Std. Deviation
DRUMS	149	.358	.569	.486	.022
BASS	149	.449	.539	.487	.018
PIANO	149	.332	.640	.488	.038

Table 3. SC Trio – 'There is no greater love'. Descriptive statistics from interonset intervals for each instrument in seconds.

The initial exploration of the timing data shows that the mean normalised IOI for each player is very similar as one would expect; .488s for the piano, .487s for the bass and .486s for the drums. This difference in the mean scores is due to the musicians beginning and ending the excerpt at slightly different points and also due to variability (rounding up or down of measurements) through normalising the IOIs. The standard deviation gives more of a picture of individuality in articulating rhythm. The standard deviation of the rhythm section players (bass and drums) and the soloist are rather different; standard deviation for the bass and drums was .018s and .022s respectively whereas the piano showed a SD of .038s over the excerpt. Within the data, there were only a very small number of outliers for piano and bass and none for drums.

For the bassist in this excerpt, the time that he played here felt very strong and comfortable for him. He talked of being able to put his 'Ray Brown [18] hat on and just keep the thing going.' (12.04.07). As far as he was concerned, *he* was carrying the time in this number; the drummer, TS, also felt there was a strength and consistency in the groove. In setting the groove, the drummer was trying to think of his playing as being 'really long...and clear and smooth and set[ting] up

something very comfortable for people to play on. It's got to feel wide...' (12.04.07).

SC, the pianist, talked about the sense of 'floating' over the rhythm section; this figurative language that suggests both a sense of disconnection and movement is not inconsistent with the IOIs from the pianist's performance which are more elastic (creating a sense of speeding up and slowing down) than those of the rhythm section players.

DC Group: 'Slippers'

	N	Minimum	Maximum	Mean	Std. Deviation
DRUMS	100	.205	.303	.256	.017
BASS	100	.222	.307	.257	.016
GUITAR	100	.160	.327	.255	.025

Table 4. DC Group – 'Slippers'. Descriptive statistics from interonset intervals for each instrument.

Table 4 gives an overall picture for the DC Group of the degree to which different instrumentalists' IOIs varied within the excerpt. A not dissimilar picture to that of the SC Trio emerges from these data.

The mean IOI over the excerpt is almost identical for all three players, the drums showing a mean of .256s, the bass at .257s and the guitar showing a tendency to a slightly shorter mean IOI at .255s. With a mean IOI between players of .256s, then the tempo marking would be set at 234 bpm. The pattern of Standard Deviation (SD) for the three players is similar to that for the SC trio. The bassist shows the least tendency to drift with a SD of around .016s; the drummer's IOIs

reveal a slightly greater variability than the bassist. The guitar player is most flexible with the time with a SD of .025s over the solo.

In reviewing the playing in Slippers, members of the group felt comfortable with the performance. AR, the bassist, commented on the excerpt of 'Slippers' saying that the 'bass and drums together are like a warm blanket, very comfortable…' (12.01.07) and she saw the role of bass and drums as quite divergent from that of the guitar with the guitar 'pulling in different directions as she solos,' adding that this 'works fine with us keeping the pulse steady.' (12.01.07). The guitarist comments on her own 'floating'; the sense of the performance of the piece as being 'playful' (12.01.07) and the feeling of freedom in playing with the rhythm.

The comments of the guitarist and the bassist about the feeling of their playing correlates with the different degrees of variability, measured as Standard Deviation, that they exhibit as they play.

JD Trio: 'Evidence'

	N	Minimum	Maximum	Mean	Std. Deviation
DRUMS	141	.210	.318	.250	.015
BASS	141	.211	.297	.250	.014
PIANO	141	.209	.297	.250	.015

Table 5. JD Trio – 'Evidence'. Descriptive statistics from interonset intervals for each instrument.

The third trio excerpt is taken from the piano solo from 'Evidence' which is played at a very similar tempo to 'Slippers', the DC Group number; a mean IOI for each of the players of .250s translates into a tempo marking of 240 bpm so marginally higher than the tempo of the DC Group excerpt.

The SD of IOIs for each player reveals a different pattern of relationship between the musicians to the previous two examples. In this excerpt, the playing of the pianist shows as tight an adherence to the mean as the rhythm section players; the SD for bass, drums and piano are almost identical at around .014 or .015s. A feature of this performance is the rhythmic interaction and variation in the solo. Although the pianist as soloist is clearly the 'lead voice' in this extract, the overall effect is almost as though all three players are soloing at the same time. It is possible that that the variability between the players would be more distinct if the rhythm section were playing a more straight ahead jazz groove.

Summary of instrumentalists' IOIs across the three trios

In two out of the three excerpts, the solo instrument displays a much greater standard deviation from mean IOI than the rhythm section players. In the DC Group and SC Trio, the soloist timing data reveals a SD of about twice that of the bassist in the same group. This indicates a pattern of playing that displays much more drift than each rhythm section player. However, this pattern of variance between soloist and rhythm section is considerably less marked within the JD Trio. In this group, the soloist data shows the same order of variance from the mean as that shown by the rhythm section (all three players in the JD Trio deviate from mean IOI at around .014-15s).

The soloists in these extracts revealed a pattern of timing variability that broadly corresponded to their years of playing experience. The most experienced soloist, JD, with a professional career of around 30 years, showed the greatest consistency of the three soloists and displayed a timing profile of the same order as the rhythm section players in his trio with a SD of .015s. The least experienced

performer, a player who had only just left college, showed the greatest variability in timing with a SD of .038s. This suggests a correlation between years of playing and the degree of consistency in timing but an analysis of their soloing on a range of material would be required for such a correlation to be more firmly established. Variability may not simply be a product of 'noise' within the sensori-motor system. Iyer has commented on the expressive potential of asynchrony between players; the greater variability of the soloist sonically reinforces their distinctive role in the band and the drift from regularity in their note placement may well be part of this (2002). While this sort of distinctive timing may not be conscious, it appears to be systematic.

Another noticeable feature of these descriptive statistics is the greater consistency and relative uniformity of the timing of rhythm section players. One might well expect this from bassists and drummers because they tend to spend more time practising the consistency and accuracy of their timing than players whose attention is more directed towards soloing (as is the case with pianists and guitarists). Whereas the soloists are seen as having an individual voice, the role of the rhythm section players is geared further towards the needs of the group and being able to blend with their partner in the rhythm section. It would be strange if that drive towards teamwork were not also reflected in some way by their individual timing profiles.

Where there are differences between rhythm sections, these once more correspond to the experience level of the players. Both DC Group and JD Trio rhythm sections are composed of players whose playing careers extend over many years and their individual timing profiles are very similar. The rhythm section in the SC Trio are less experienced on the professional jazz circuit (at the time of recording, both bassist and drummer were still in the final year of music college)

and their IOI timing profiles show greater variability. However it should be stressed that the difference in variability between each of the rhythm section players is still very small (the most consistent being .014s and the least being .022s).

Another factor which may be equally valid in explaining the slightly greater variance of IOIs in the SC rhythm section is their playing a tempo with a bpm at around half of the other two extracts. Studies within the timing literature point towards greater variability in timing production when interval durations are progressively larger (Wing & Beek, 2002).

It is the bassists as a group that show least deviation from mean IOI. The standard deviation for all three bassists is within .004s (around .015s SD) of one another, whereas the SD's for the other instruments show greater dispersal. It is likely that this greater accuracy is in part due to their playing 1) much simpler rhythmic patterns than the other players and 2) playing only single lines. Given these factors, one would expect the cognitive load to be less. Once again, the difference in IOI variability for these players is small.

In this part of the chapter, I have established the individual timing profiles of these players. Now I look in more detail at the way in which these individuals fulfil their temporal roles and relationships as rhythm section players or soloists.

6.3 Timing relations between player pairs

So far, the three case studies revealed individual timing profiles for the players which showed a somewhat different profile between the soloists and rhythm section players and underlined the different types of musical work that rhythm

section players and soloists accomplish. The variations in timing consistency were also suggestive of the players' different levels of experience. At this point, the analysis moves to pairs of players and first looks at the relations within the rhythm sections and then between soloist and rhythm section. The timing analysis is framed in terms of phase relationships between players, an approach based on that developed within entrainment research.

The nature of entrainment, discussed in Chapter 3, as a temporal phenomenon through which independent rhythmic activities become harnessed together is a telling description of the work of a jazz group. One of the characteristics of entrained behaviour is the ability of the system to recover from a disturbance in the coupling between the independent parts of the system. In the case of an improvising group, one can examine the changes in the degree of entrainment as it unfolds over a piece of music and assess how the system remains in a coupled state over that time. At the outset, it is worth stating that there seems little doubt that a group of musicians would be entrained and the cognitive mechanisms for how this might be accomplished are fully set out in 3.3.1. Over this section, my interest lies in the subtleties of the entrainment between players and particularly how these vary with the musical role that the different players occupy.

The two types of temporal relationship that I examine now go to the heart of the 'inherent tension' that Monson (1996, 66) writes about between individual need and collective commitment.

There are three dyadic relationships at work within a trio:

DRUMS – BASS

SOLOIST – DRUMS

SOLOIST – BASS

In addition to personal dynamics that may impact on how these role relationships work, there are distinctions between each dyad according to the temporal work, that each accomplishes. The main difference in role however lies between the Drums-Bass dyad and the Soloist – Drums or Bass dyads. The tension between collectivity and individuality is best expressed between these two pairs.

There is an important and distinctive aspect to these working relationships within the jazz trio that is set up by the role of the pianist/guitarist. Whereas the drums and bass are unambiguously seen as part of the rhythm section, the guitarist and pianist roles in jazz straddle the rhythm section and soloist. In jazz quartets, pianists and guitarists fulfil a dual role; they work as part of the rhythm section when accompanying horn players but usually become soloists themselves on every tune. Within a trio setting, this dual role for pianists and guitarists persists but is restricted to those points in the performance where either the bassist or drummer take solos. In contrast to horn players whose role is unambiguously defined as 'soloist', the pianists and guitarist in this study are deemed to have an awareness of both sides of the collective-individual dichotomy. However, in these extracts, both pianists and the guitarist are functioning as soloists. Therefore, in the following sections, I often refer to the drums and bass as 'the rhythm section' and the piano/guitar as 'soloist'. This is not meant to imply too rigid a division between the players. It is for terminological convenience and does provide a point of reference for analysing the different sorts of musical work being accomplished during these extracts.

6.4 The rhythm section

Above, in 6.3, I explored some basic timing characteristics of the individual players with reference to their ideas on and experience of keeping musical time. The temporal discourse in jazz is not just however about individual players' timing traits; the respect for the individual skills that players display is tempered in subtle ways by the requirements of working for the group – a sense of solidarity. The unbridled pursuit of virtuosity is frowned upon unless married to an aesthetic that values a performed integrity. It is in the work of the rhythm section that a sense of solidarity and indeed of musical altruism appears to be most developed. SL, bass player with the SC group spoke of this sense of duty in his description of paying attention to the musical time,

> 'I suppose when I play, I'm always conscious of 'How's my time?, Does that work within the group?, Does it feel good' and if not, I'll try and hang back or I'll try and push ahead' (12.04.07).

For this player, the considerable skill involved in keeping time is allied to an awareness of group dynamics and his role within it. His musical integrity is bound up with temporal consciousness and the requirement to place any such heightened consciousness in the service of the group.

For TS, the drummer with the SC Trio, the sense of solidarity within the rhythm section took precedence over his sense of supporting the larger group,

> 'To be honest with you, in a musical situation, I'm with the bass player; I'm in there every time' (12.01.07).

His implication was that whatever the playing conditions and whatever the level of competence of the bass player, TS still felt a sense of loyalty to the rhythm section. He gave a specific example of this solidarity between bass and drums. He

spoke of sacrificing his own face in maintaining this musical integrity; his bass playing partner was losing tempo badly on a very fast tune and in his words,

> 'S. [*the bass player*] wasn't going to make this [tempo] for the whole tune, so I just took the edge off it slightly. Got to the end of the head and M. [*bandleader]* stopped the tune, and said to me 'You're letting this slow down' (12.04.07).

For this player on this occasion, his role as part of the rhythm section and the sense of solidarity that this entailed took precedence over saving face for himself through maintaining the original tempo. This musical 'sacrifice' must be understood against the fact that most musicians place the responsibility for tempo at the door of the drummer. By deliberately losing speed, he was declaring allegiance to the bass player but in so doing he was laying himself open to the charge of incompetence. For drummers, the maintenance of a steady tempo over the course of a number is a key part of their work and this sensitivity to tempo can become a source of frustration if the rest of the group are not pulling their weight. A double frustration when the blame for keeping poor time is still attached to the drummer. As drummer, BB, commented

> 'It's the old adage, it starts speeding up and then they turn round and say to the drummer 'it's your fault' and that's nonsense. I've been in those situations myself and you can play the most perfect in-time groove and if no-one is listening and they've all got their heads down…it's going to go out of time, it's going to speed up or slow down' (16.01.07).

Being part of the rhythm section also includes an understanding that players occupy a certain 'spatial' niche in relation to the other players. At any point in the performance, there will be a constellation of time points which contribute to the

feeling of the time for the musicians. In particular, rhythm section players get known for their way of playing time in relation to others. Notable examples of players who became well known for their particular approach within the rhythm section include Ray Brown (1926-2002), one of the great jazz bass players and someone who was recognised for his particularly propulsive playing and Steve Gadd (1945 -), a session/jazz-funk drummer working in the last 25 years, who plays with a highly distinctive 'behind the beat' style. In most cases however, a player's approach to playing time within a section may not be quite so strongly marked; a highly distinctive time feel can run the risk of making it more difficult for other players, especially inexperienced players, to gel with an individual's strong impetus to play ahead of or behind the beat. BB, drummer with the DC group, made clear that even with experienced players, there usually needs to be some prolonged playing together before the subtleties of the rhythm section dynamic can be explored or even properly sensed. He commented on the bass/drums relationship in particular saying,

> 'all this stuff we're talking about only really works in a proper band, because so often in the jazz thing, you get together, you do a gig, you haven't even had a rehearsal; you've just met the bass player for the first time and it's all thrown together' (16.01.07).

Part of the skill in being part of the rhythm section is the ability to notice and react to the feeling of the time around you. As SL (bass player) commented, '[within] say a four bar passage, I'll hear things being stretched if someone's playing too far ahead or too far behind. It just won't feel right; it'll feel too heavy, too baggy [19]...' (12.04.07). Deliberately initiating such motional patterns is part of the rhythm section's expressive palette and used well can be powerful for all the players

involved. However, the use of such manipulations of the time needs to be well judged. BB continued,

> '[with players that I don't know], I am not going to start pulling this stuff out the bag because you can scare them or people start following you…..'(16.01.07).

However, with players that he did trust, there could be a real sense of liberation as a rhythm section developed these subtleties,

> 'When you get in that situation, it's great because you know everybody is listening, you know they're great musicians, they can take it…this is liberating and then you can start pushing and pulling things a bit' (16.01.07).

Charles Keil has written eloquently about such rhythm section relationships, particular combinations of players and how the dimensions of timing in bass and drums can work in certain ways depending on these combinations (Keil, 1994). I would be a little wary of some of the claims that Charles Keil makes about players, especially those regarding bassists whose different dimensions according to Keil are not formally recognised within the jazz community (not that this in itself invalidates Keil's claims). However, it is the case that certain well known pairings appear to have been well suited in terms of a mutually supportive approach to timekeeping.

Between bass and drums, the longevity of a playing partnership will clearly be felt and may have an impact on the ability of the players to describe their particular timing relationship. Within the DC Group, BB had only recently joined the group so while there was a feeling of mutual support, it was hard for the musicians to describe how their timekeeping worked. He pointed out that,

‘ I’ve done a few gigs with the band so it’s still early days for me so I’m still in that headspace of just trying to be not getting away too much…AR is very solid; she’s very easy to play with. It‘s great you know, she has got really good time’ (16.01.07).

The bassist in the group spoke similarly that it was easy for her to play with the drummer.

In the SC Trio, the bassist and drummer had worked with one another for about 4-5 years and with that seems to have come a very clear sense of the ‘spatial’ layout of their shared time. The bassist, SL, described his timing in these terms,

‘I’m usually just ahead of the beat…it should be ahead of the beat enough to give everyone a lift and to make sure, just constantly trying to remind the whole group that we’re going forward…T. [*the drummer*] is usually a bit behind me; it could be that that’s personally how he hears music or maybe that’s just how he plays with me because I’m a little bit ahead [so] he plays a little bit behind to strike that balance’ (12.04.07).

The pianist, SC, understood the time relationship of the bass and drums to be as SL articulated it but in rather more blunt language,

‘T. drags and S. pushes and they tend to balance each other out’ (12.04.07).

Neither of these views were completely consistent with the views of the drummer, TS, on his own playing. His own ideas about his playing in relation to the bass suggested a much more free relationship with the bass player,

‘I need to know that I can play into the bass…really play into the bass, you know, and play around it, and really go in front of it, and hang off it, link with it when I need to’ (12.04.07).

The rhythm section in the third trio, the JD Trio, enjoyed a different relationship again. They had played with each other and knew each other's playing over many years but the opportunities for playing together as a trio (and before joining the trio) were limited to a handful of performances. In-demand rhythm section players may work with a spread of groups and pick-up bands [20] and indeed it may only be through work with such a spread that they can earn a living. Within that range of groups, a single group may work no more than half a dozen times per year and so in this case the rhythm section rarely got the chance to work with the other on a regular basis.

The musicians quoted above make it clear that the dynamics of their playing together and the feeling of being in time together are enormously subtle. How are these feelings of being ahead or behind reflected in the timing data from these performances?

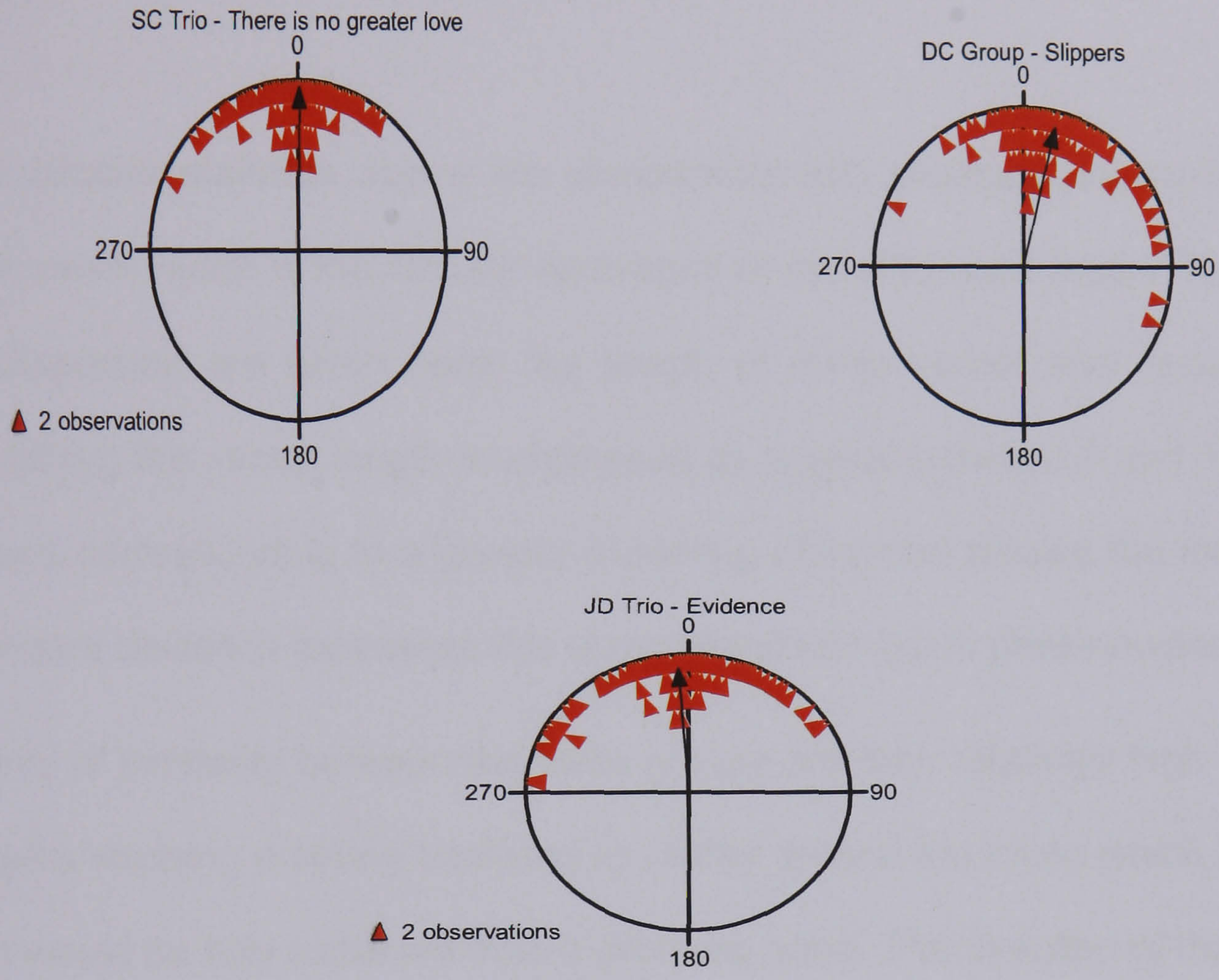
The rhythm sections – summary timing plots

At this point, I go on to look at the forms of entrainment between these player dyads. In 3.3.1, the two parameters used to describe forms of entrainment were outlined. These are period and phase. Period describes the length of time it takes for a cycle (the IOI in this case) to complete; phase, the measurement to be used here, describes the point in the cycle at which it is completed. When two players are in an entrained state together, we can see the changing strength in the coupling between the players expressed by shifts in their relative phase, that is the asynchrony between the players as they play a note together.

To obtain the following phase plots, absolute timing data from pairs of players were converted to phase angles. Phase angles can be thought of as the degree of

asynchrony between players expressed as a distance of between 0° and 360°. Through this entrainment modelling, it is possible to obtain a valuable relational picture of the timing states within these three groups.

Before looking at each rhythm section relationship in more depth, below are summary plots for the rhythm sections in each group expressed in circular form.



Graph 1. Summaries of phase relationship for each rhythm section [21].

The overall phase relationship for each rhythm section is shown in these circular plots. Individual red triangles display the angle of phase for any shared time points between the players. Triangles plotted closest to 0° are showing the most synchronous playing between bass and drums; points plotted between 0° and 180° describe the drums ahead of the bass and those between 180° and 360° describe the bass ahead of the drums.

	DC Group	SC Trio	JD Trio
Mean Vector (μ)	13.885°	0.58°	356.146°
Length of Mean Vector (r)	0.904	0.96	0.895
Circular Standard Deviation	25.733°	16.313°	26.94°

Table 6. Circular descriptive statistics for rhythm section phase relationships.

The circular statistics above are comparable with standard descriptive statistics. The mean vector is the circular equivalent of the arithmetic mean. Two measures of dispersion are given here, the length of mean vector and circular standard deviation; the vector length is expressed as a value between 0 and 1, with higher values corresponding to a greater clustering of vectors around the mean. Circular standard deviation expresses this same dispersion but in phase angles.

Points of similarity between the three groups are their relatively high mean vector lengths showing a strong tendency to cluster around the mean which is something that would be fully expected from a grooving band. The direction of the vectors are also very similar, with two of the excerpts displaying a mean that is very close to 0°, that is completely in phase. As with the arithmetic mean, the mean vector can be misleading when the dispersion of the data is wide.

The 'tone' of each relationship however is subtly different. In 'There is no greater love', neither bass nor drums show a marked tendency to lead the other; in 'Slippers', the drums clearly lead the bass on most onsets and the reverse is true in 'Evidence' with the bass tending to lead the drums.

The three excerpts are all synchronous to a large degree but synchrony does not always imply entrainment. It was pointed out in 3.3.1 that a feature of entrainment is the capacity of the system, in this case musicians, to remain locked together

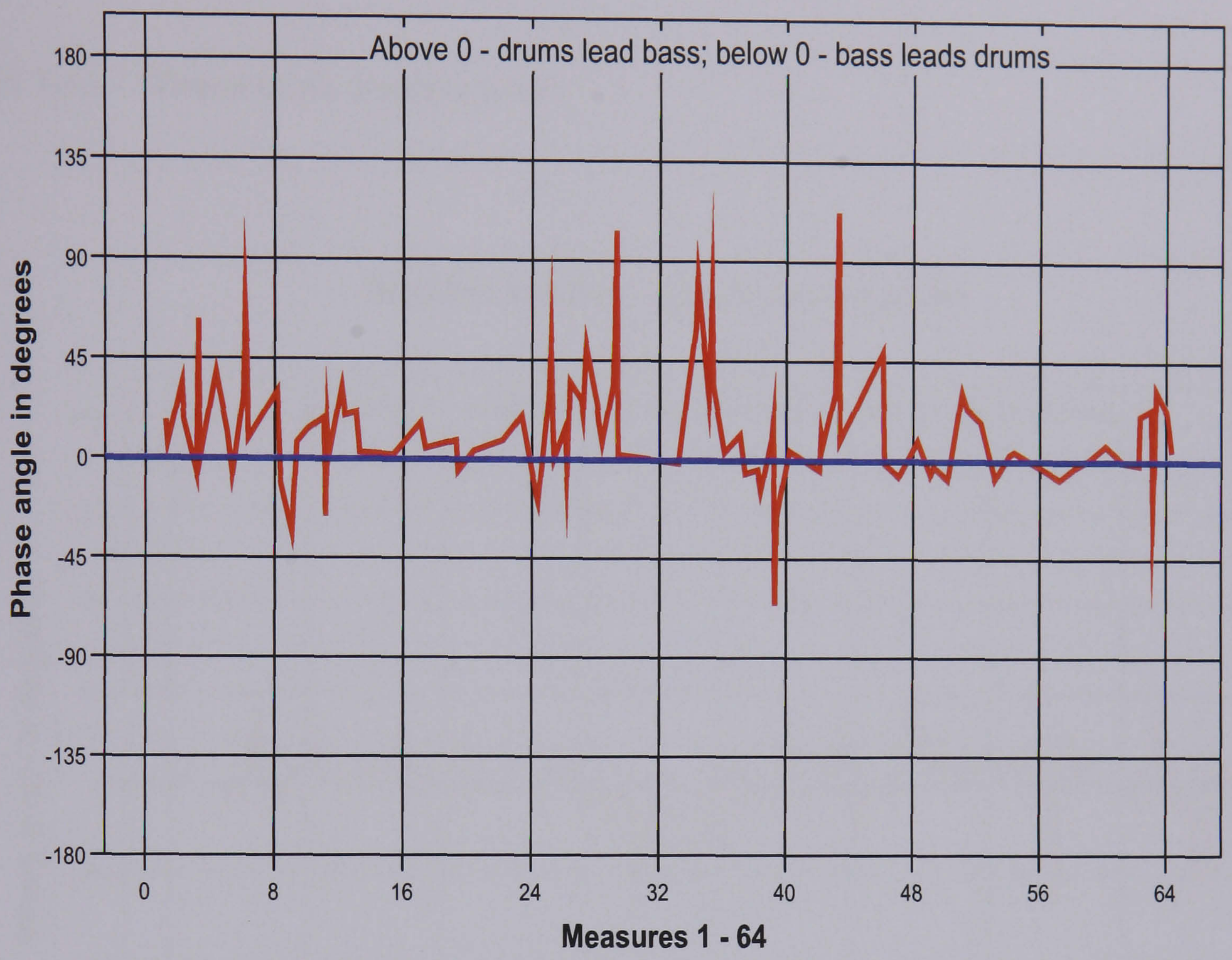
despite any disturbances within the system that may push them apart. This dynamic becomes more apparent as one looks at the phase relationships over time.

Linear phase plots for the rhythm sections

The following graphs present the same data as in the previous summary plots but show the changes in the phase relationship over time. In each of the following graphs, the relative phase between the rhythm section players is depicted through the course of the solos.

The zero abscissa running through the centre of the graph marks the point of complete synchrony between each pair of players. In all three graphs displaying the rhythm section, the ride cymbal is ahead of the bass at points where the line goes above zero towards 180°; when the line moves below zero towards -180°, this shows the bass ahead of the ride cymbal.

DC Group – 'Slippers'



Graph 2. DC Group – linear phase plots between rhythm section players.

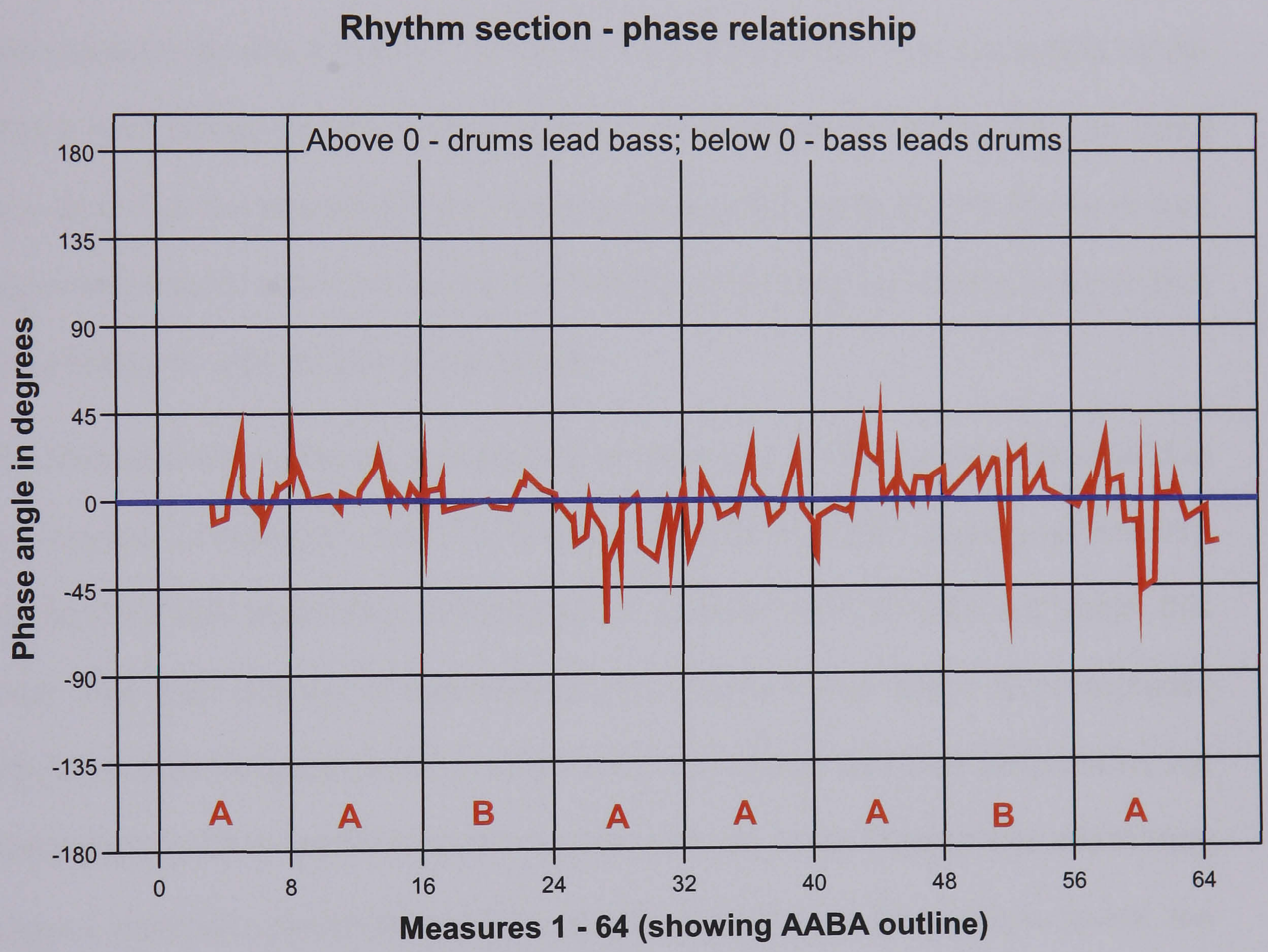
This graph shows a very clear pattern in the relationship between bass and drums.

The drums plays ahead of the bass on 74/104 shared quarter note events, that is 71% of the shared onsets. This tendency of the drums to lead the bass is marked also by the degree of leading; when the drums are ahead, this tends to be more marked than when the bass leads.

In talking about his playing relationship with AR, BB spoke of generally being conscious of 'playing on the front of it, it makes it more exciting' and he also acknowledged that on this occasion, due to his lack of experience in playing these

numbers that he may have been stressed and that 'if I am a bit stressed, I tend to rush a bit more' (02.07.08). His sense of playing at the front of the beat appears to mesh with the timing data in a quite consistent manner.

SC Trio – 'There is no greater love'



Graph 3. SC Trio – linear phase plots between rhythm section players.

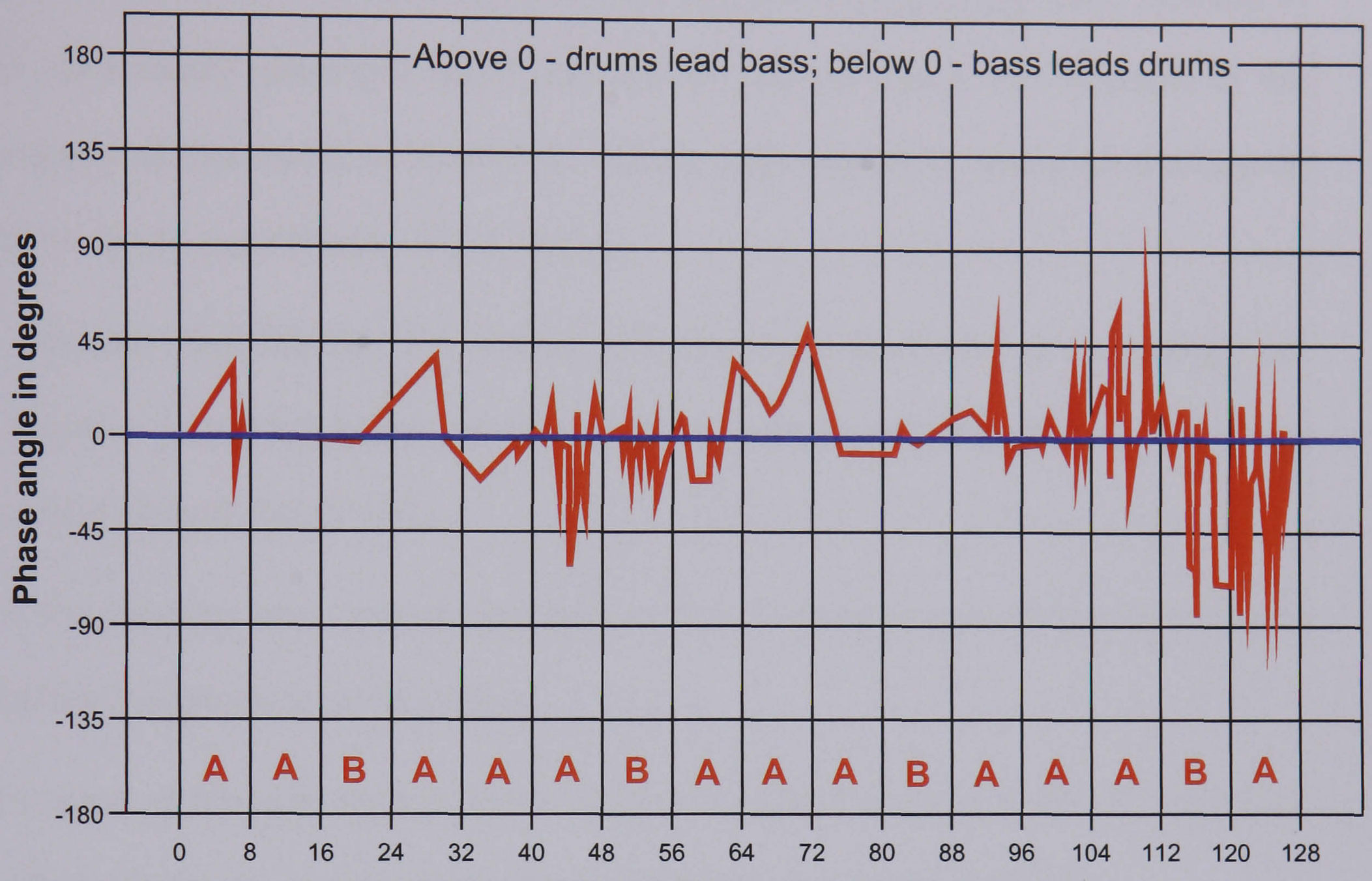
Graph 3 shows the phase relationship of the drums and bass in the SC Trio. As for the previous graph, any plot points above zero point to the drummer leading and any below zero show the bassist ahead of the drums.

Over the extract, the drums lead the bass in 55% of the onsets (83/152) and so there is a much less obvious sense of one player preferring to lead the other. The ahead/behind positions appear to undergo periodic reversals at particular parts of the solo and these appear quite distinct patterns of change. However, the phase relationship remains very tight throughout this whole solo. There is no real sense of one or other of the players strongly pulling away from the other.

In some contrast to the DC rhythm section, the players had a quite definite view of their relationship which did not chime with the timing data. The comments of the bassist and pianist on the rhythm section, recorded earlier in this section, were very clear that the bassist led and the drums followed, although the drummer was more circumspect about his spatial positioning, describing his playing in terms that did correspond with the performance data.

The discrepancies between players' verbal reports and their actions could be due to a number of reasons - that this piece is not typical of their playing relationship and so their talk about their relationship is accurate but just does not match this piece, that their playing is synchronous to a degree such that it is perceptually difficult to feel the ahead/behind relationship with clarity and their perceptions are modulated by other performance features such as body movements which may suggest particular dynamics between them, or that their perceptions reveal the difference between the physical onsets displayed in the graph and the perceptual onsets as they feel them. My own sense is that the third of these possibilities is less likely due to the slow attack time of the bass – if these views were highlighting the perceptual/physical onset discrepancy, it would be more likely that players would feel the bass as late due to its slower rise time.

JD Trio – 'Evidence'



Graph 4. JD Trio – linear phase plots for rhythm section players.

Graph 4 shows a phase pattern between bassist and drummer in which the bass tends to lead; out of 143 onsets, the bass is ahead for 57% of shared onsets (that is 60/143 onsets).

At points when the drums are played ahead of the bass, the relationship tends more towards synchrony than the points when the bass is ahead, in which cases the bass tends to lead more strongly. It is particularly evident in two areas of the solo – firstly, in the second chorus and then in the final quarter of the excerpt where the bass moves significantly further ahead of the ride through the fourth

chorus of the solo. This corresponds to the final part of the excerpt where the bassist is playing a walking bass line.

The bassist himself in this excerpt had two particular comments about this playing here. First, his own assessment of his playing as tending to lay back resulted in him consciously pushing forward and second, he felt that it was possible in the company of this particular drummer, held in high regard by many on the scene, that he would push harder. In his words,

'...because I feel like this is a serious drummer and I don't want to be feeling I am dragging, I might actually be putting more energy and thought into that thing [*pushing ahead*]' (02.07.08).

ST, the bassist, also commented that in part, it is the sound of the bass which requires the player to push, saying

'The swell of the note means that it is more important to push it ahead; I certainly don't feel that I am someone who pushes ahead too much' (02.07.08).

ST also made it clear that the degree to which he pushed ahead would depend on the drummer. Playing with drummers who tended to push ahead strongly required him to hold back more and vice versa. From the pianist's viewpoint, he considered that both the drummer and bassist played quite 'centrally' (JD, 09.01.07).

Summary of rhythm section timings

Charles Keil suggested that rhythm section pairings work in quite particular ways. Drummers who have a particular approach to timing appear to work better with bass players with equally definable profiles (Keil, 1994). Keil sets up an intriguing taxonomy of American rhythm sections with his informal assessment of the various combinations of players. A direct comparison between the rhythm sections in this

study and Keil's typology of bass and drums is difficult. Keil brings in other factors such as the manner of the plucking of the bass and the drummer's placement of the 'skip beat' as all contributing to the fit of the relationship. These are fascinating speculations but lack the precise data for a sensible comparison to be made between his work and mine.

There are a number of points that emerge from these data which may be relevant in assessing Keil's rhythm section types. Firstly, that there are distinctive *overall* patterns between the players – the relative width of their playing relationship which I have expressed in phase angles and the extent to which one player leads the other. These summary relationships were displayed in the summary phase plots. However, by examining these relations over time, one can see a much more complex picture emerge in which the timing relations between players modulate over time. The entrainment between these players is sufficiently elastic to allow for considerable expressivity in the relationship.

6.5 The soloist and rhythm section

In the previous section, I examined the timing relationship between players in the rhythm sections of these groups, expressed in their words and also their actions. In moving towards an understanding of groove as a group process however, the role of the soloist as a contributor to the overall time feel needs to be assessed. As was clarified in the last section, musicians in the rhythm section take their responsibilities for the time and feel of the music very seriously. Their livelihood depends on this. However, the soloist is typically seen as occupying a rather

different role in the band. Where do their responsibilities for the time lie? How does their work as soloist affect their approach to time and groove?

Although there are a number of well-known exceptions, the soloist in a jazz group will typically be the leader of the band. In this study, the principal soloists (playing piano and guitar) are also the bandleaders.

The soloists in this study held similar views about aspects of their playing relationship with the rhythm section. A repeated view was their wanting a highly interactive relationship with the drummer. JD commented that

> 'the great trios were always very interactive and the boring ones are, you know, just bass and drums and some guy sitting on top of that... and it's finding the right combination so for me it's all about [trying] to develop a dialogue, a language between the players and hopefully try to do it in the moment' (09.01.07).

SC spoke in a similar way about enjoying playing with drummers who

> 'shape your solo so you feel like you can play something and he will comment...rather than [when] they just sort of play time; you play something else and still nothing, they don't bite. I like drummers so it is a game'(30.06.08).

This interactive element sits alongside the requirement that the bass and drums provide a stable, supportive environment for the soloist. In Ingrid Monson's book, one of the interviewed drummers, Michael Carvin likened this dual aspect of drumming to 'solid' and 'liquid' aspects of rhythm, providing a platform for the soloist but also being fluid within the interaction (1996, 55).

The individual timing profiles displayed in 6.2 perhaps speak of this dual role for the drummer. With their highly expressive role, the soloists tended to show much

greater timing variability than the rhythm section players. However, within the rhythm section, the bass players showed the least variability in timing, with the drummers just slightly more variable. This timing profile, halfway between bassists and soloists certainly reflects the way in which the drummers in this study occupied an interactive middle ground between the anchoring role of the bass player and the freer rhythmic role of the soloist.

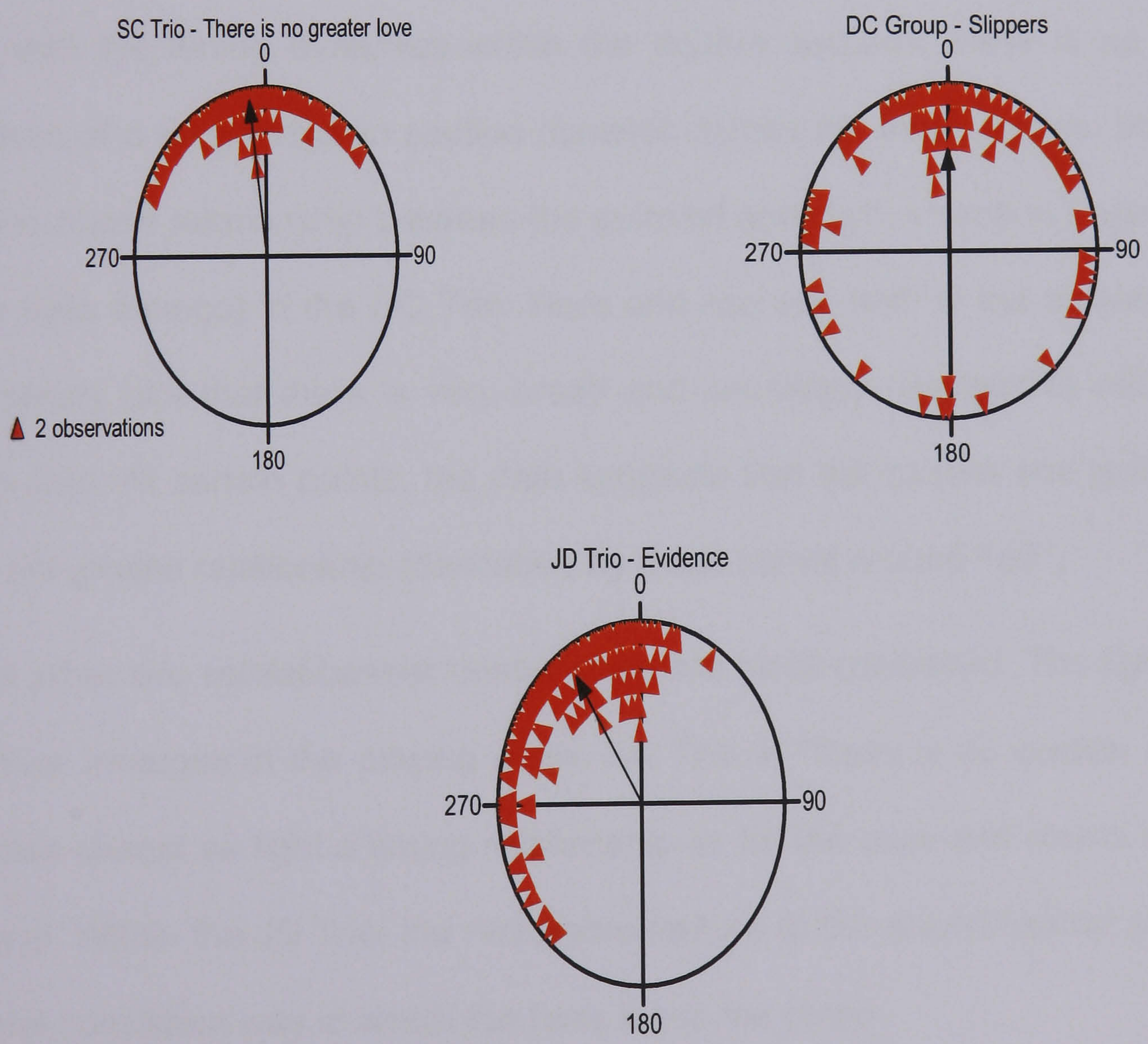
As mentioned, in addition to this interactive role, the soloists were also looking for support in another sense from the rhythm section. Support for the soloist also came in the form of consistent timing and a supportive attitude towards playing.

Rhythm section players in this study commonly expressed the idea that it was important to be supportive. This was seen as one of a number of positive attributes that good rhythm section players possessed. However support was not unconditional; in a manner that resembled the attitudes of orchestral players in relation to conductors (Faulkner, 1973), some players expressed their frustration if the soloist was not contributing to the timekeeping in the way that the rhythm section are obliged to. In answer to my question on why it was important for him to work on his own time, BB replied 'Well, I think everyone needs to' implying the responsibility on all players to improve their time although later in the same interview, he stated that 'horn players generally never think about any of this stuff' (16.01.07), thus distinguishing rhythm section players from soloists in their sensitivity towards time.

At this point, I want to give an overview of the soloist's timing profiles in relation to the rhythm section. It has already been established that in two of the three extracts, the soloist's *own* timing profile (in terms of interonset intervals) was significantly more variable than the profile of the rhythm section players. How does this profile relate to the notion of being ahead or behind in the timing mix?

In the following section, I give a summary description of timing between soloist/bass and soloist/drums but in comparing the phase relationship between the soloist and rhythm section, I have used *only* the bass timings as representative of the rhythm section. Across all three trio excerpts, the bass displays the most consistency of timing and in the ethnography is seen as having a role that anchors the time feel of the group. Thus it seemed clearer to use the bass as the detailed point of comparison between soloist and rhythm section.

Summary plots of phase relationships



Graph 5. Summaries of phase relationship between soloist and bassist.

	DC Group	SC Trio	JD Trio
Mean Vector (μ)	359.68°	352.405°	327.274°
Length of Mean Vector (r)	0.609	0.925	0.828
Circular Standard Deviation	57.082°	22.701°	35.222°

Table 7. Circular descriptive statistics for solo/rhythm section phase relationships.

In the above summary plots and table of circular statistics, phase angles between 0° and 180° indicate the soloist leading the bass and those between 180° and 360° show the bassist ahead of the soloist.

As with the timing dynamics within the rhythm sections, there is no consistent picture of a soloist/rhythm section dynamic across the three groups. Most striking is the phase relationship between the guitarist and rhythm section (represented by the bass timings) in the DC Trio. Here one can see both in the statistics and the summary plot that there is very broad and seemingly changeable relationship in this solo. At certain points, the data suggests that the bassist and guitarist are in an anti-phase relationship (described by those points around 180°).

The other two soloist/bassist relationships are more consistent. The tightest phase picture emerges in the playing of the SC Trio in 'There is no greater love' which shows almost as tight a timing relationship as for the bass and drums in the same group. Within the JD Trio, the noticeable feature of the soloist/bassist relationships is the consistent way in which the bass leads the piano.

Linear phase plots

The following graphs show these phase relationships over the course of the excerpts. Each graph is preceded by complementary descriptive statistics showing the asynchrony in seconds between soloist/drums, soloist/bass.

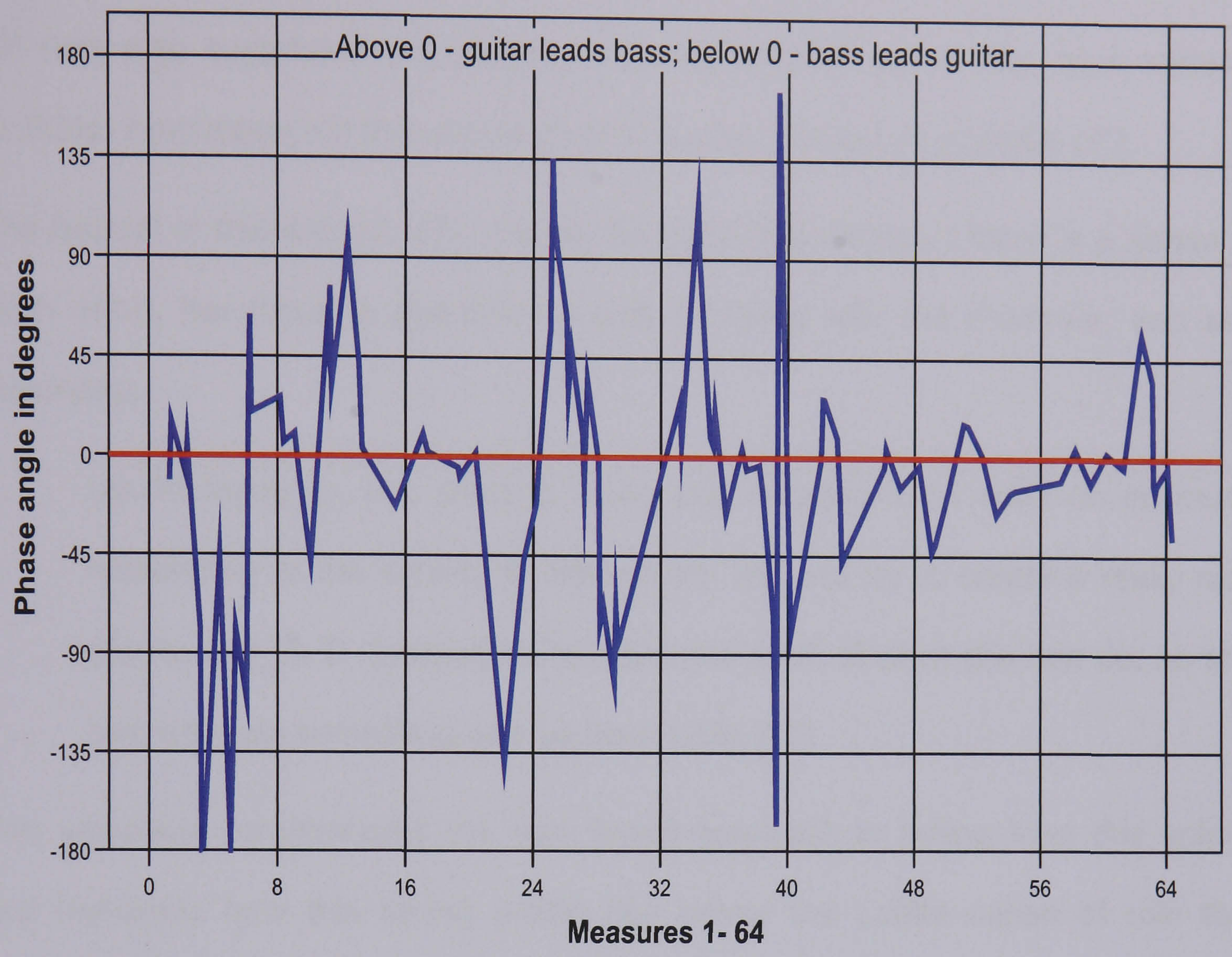
DC Group – 'Slippers'

The following table gives descriptive statistics for the soloist's relationship with bass and drums.

	N	Minimum	Maximum	Mean	Std. Deviation
Guitar/bass	104	-.113	.168	.011	.060
Guitar/drums	104	-.153	.174	.017	.063

Table 8. DC Group – Descriptive statistics for guitarist/bassist asynchrony in seconds.

The relationship between the soloist and the other two players shows a quite different picture to the internal relationship within the rhythm section. The mean asynchronies between guitar and bass (0.011s) and between guitar and ride (0.017s) indicate a tendency for the guitar to be 'tighter' with the bass than with the drums. As the guitar moves ahead and behind both players in this track, then the mean may not be terribly helpful in portraying these relationships. The Standard Deviation for both relationships stands in some contrast to the SD for synchrony between the rhythm sections players; .063s for guitar/drums and .060s for guitar/bass whereas the drums/bass SD stands at .026s. These figures confirm the fluidity of the guitarist's playing over the rhythm section.



Graph 6. DC Group – linear phase plots between guitar and bass.

This fluid relationship is shown graphically above. Points in the graph where the line moves above zero describe the guitar playing ahead of the bass and vice versa for points below the zero line. In comparison with Graph 2, which shows the rhythm section relationship for this trio, here is a very different picture of entrainment between a pair of players. The coupling between bass and guitar is a much weaker one than that between bass and drums – the variability of the coupling is considerable.

There are 17 events, above 90° and below -90° in which the timing relationship is such that it could be considered 'out of time', remembering that each of these

timing events is on a shared syntactic time point. Given the state of the coupling between the bass and drums which is fairly consistent, it appears that it is the guitar that is more mobile in relation to the rhythm section. The earlier individual IOI data also suggested this mobility showing that the guitar was more variable (c..028s) from mean IOI than either rhythm section players by a factor of 2.

The bassist in this extract, AR, makes the point that although there is a sense of team effort, her focus is directed towards grooving with the drummer, and she comments

> 'you're trying to, you want to listen and respond but I don't do so much responding to the soloist, B. [*drummer*] will, we try to create a really nice groove say for D. [*soloist*] so to make the most of what she can do, so she can really do something and be free'(12.01.07).

This comment complements the very broad approach to timing from this soloist and highlights how this timing profile can mirror the subtle sense of role that soloists and rhythm section players feel. Although there were tunes played in the recorded performances where the bassist felt that her attention was directed towards playing closely with the guitarist, for the most part, she had a strong sense of a link with the drummer in establishing groove. In terms of a social relationship, the reverse was the case. AR and the guitarist were extremely close friends who had played together for many years while drummer, BB, was a relatively recent addition to the group. However, in terms of role, AR was clear that there was some sense of separation of the work between rhythm section and soloist. This was augmented by guitarist DC's very strong 'rhythmic sense' (AR, 12.01.07). By this, AR, was alluding to the strength of the guitar player's communicated feel rather than any metronomic accuracy, in much the same way as bassist ST commented on the distinction between sense of time and sense of feel. The soloist's

comments on her own playing reveal an acute awareness of the way in which she manipulates the time in relation to the rhythm section,

> '...my natural thing is I like kind of floating over things and moving things round and I am sort of aware [that] it is a bit like a wave; that's why I keep thinking of this *[makes wave gesture*] you know, it's like a wave thing where, sometimes you just pull back and let it go again , pull back and then you just come forward and that's actually what it feels like to me when I'm playing...you can only do that by having a real sense of where the actual time of something is. I do have my inner sense of time and with the drums, we are all playing together, and I am just very gently doing this. I am not trying to pull people - you know how it's like when you really throw people, I kind of just clang in slightly out of time, and everyone goes 'aah' like that and obviously that can happen sometimes but it's more like a very gentle fluctuation and I am actually aware of it' (12.01.07).

This description of being free with the time is very different to the perspective of the drummer BB in the same group. The sense of being able to manipulate time for BB is articulated in a way that points to a studied competence; the subtle pushing of the time is bound to his sense of himself as a professional and whereas being 'free' with the time for the guitarist is felt as part of her natural personality, there is an understanding on the part of the drummer that you can all too easily be blamed for timing issues within a group and great care needs to be exercised in looking after the time. These different approaches to time also, in this case, correspond to the leader/hired player dynamic. Rhythm sections tend to be hired and fired by soloists, so while there are often strong social ties between players developed over many years, there can be an accompanying set of power relations

which feed into the degree of freedom that one has in using the temporal, textural and harmonic building blocks that go towards a performance.

BB also pointed to the dual role for the drums in accommodating the demands of a steady groove and the need to interact with the soloist. His separating the groove from the surface phrasing corresponds to the guitarist's description of her playing around with the time and yet retaining an internal sense of where the beat is. For both musicians, in rather different ways, there is an understanding of relating to one's 'internal clock' and yet being expressive with time through the performance. As he comments,

> 'in a trio situation I guess what I'm trying to do in terms of the groove is lock with A. [*bassist*] and gettin' it just to feel nice , not just in terms of playing in time with each other but just getting that nice relaxed feeling happening with the groove and so like that's one part of your brain and the other part of your brain is feeding from the soloist which is D. [*guitarist*] so, in terms of phrasing I am listening more to D. but in terms of the fundamental groove, I am trying to lock in with A' (16.01.07).

The rhythm section is often described as a single element in relation to the soloist. DC, the guitarist in this group, however, saw the role of the bassist as occupying a distinct niche in the band with the stage set up replicating her role in the music, 'you put the bass right in the middle…the bass is holding together that relationship' (12.01.07). In both temporal role and stage position, the guitarist recognised the bassist's centrality in stabilising the group feel. She commented further,

> 'I like bass players who kind of you know…can sit and hold…but I like drummers who are fluent and fluid so if the bass player sits and the drummer sits as well, it creates too much static kind of thing' (12.01.07).

The soloist/rhythm section division could also be quite blurred depending on the material that the group was playing. From the bass player's point of view, there were numerous pieces in their repertoire which demanded a truly collective approach and she contrasted this with most of her other playing in which the bass and drums always stood at some distance from the soloist,

> 'Certain grooves, then once we get going, I am probably locking in with, trying to lock in with the drums more than anything else…but you know a lot of the tunes…maybe there's a riff or something that we are all playing or I might be doubling a riff with D. [*guitarist]* or something like that so then it's very much a kind of collective thing' (AR, 12.01.07).

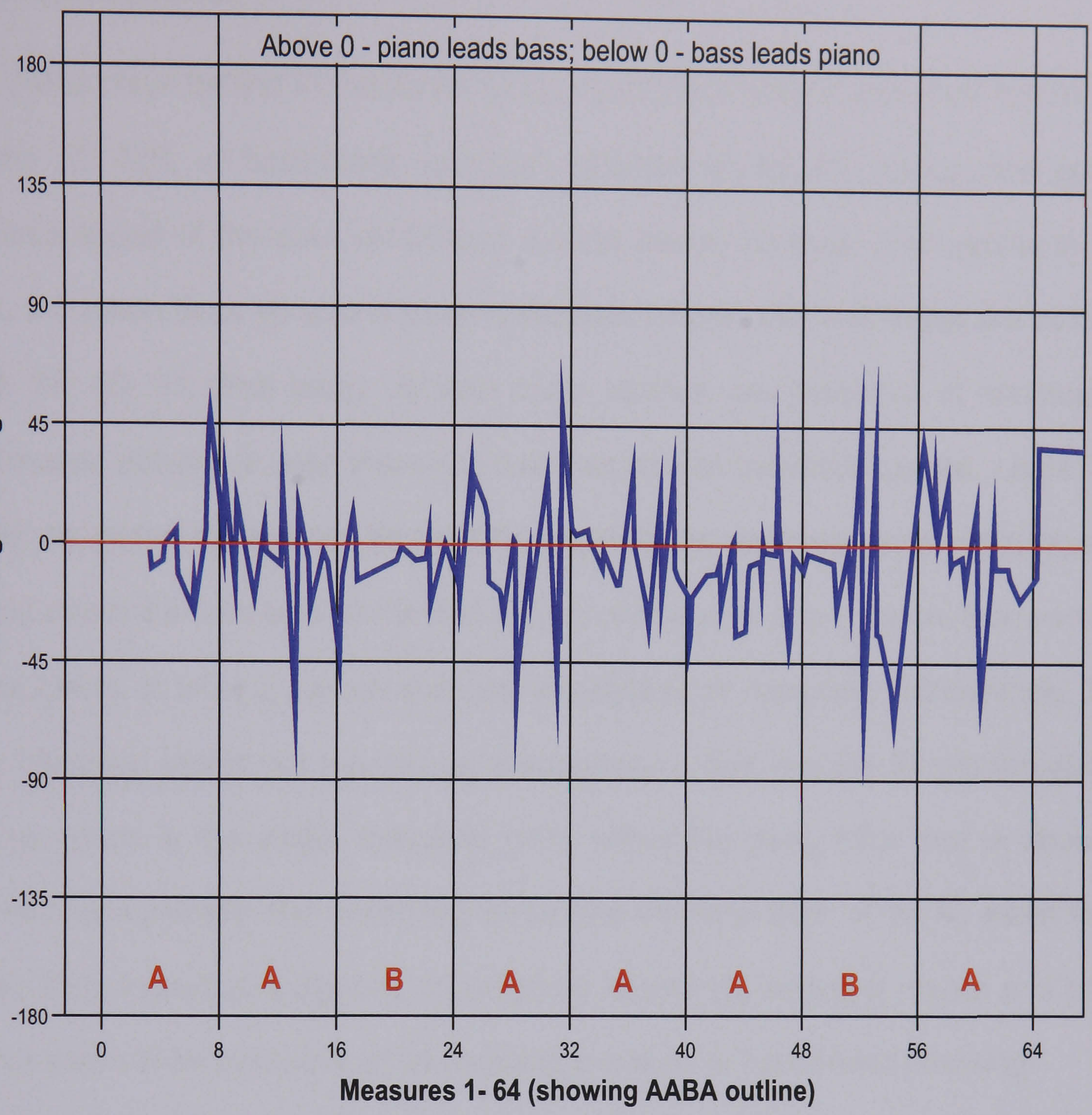
In this particular section of 'Slippers', the roles of the three players conformed to standard practice within a contemporary jazz trio with the bass playing a walking line, the soloist playing freely above the rhythm section and the drums occupying a split role.

SC Trio – 'There is no greater love'

Table 9 shows the descriptive statistics for the pianist with rhythm section members, giving mean and SD of their asynchrony expressed in seconds.

	N	Minimum	Maximum	Mean	Std. Deviation
Piano/bass	153	-.075	.178	.015	.041
Piano/drums	153	-.147	.238	.016	.050

Table 9. SC Trio – Descriptive statistics for piano/bass, piano/drums asynchrony in seconds.



Graph 7. SC Trio – Soloist/bassist phase relationship

This graph illustrates the relative positions between bass and piano. As for the previous graph, time points above zero show the pianist leading and below show the bassist in front of the piano.

Summary statistics point to tighter timing relationships between the rhythm section players and the soloist than is the case for the DC Group. But except for this greater tightness, both groups exhibit very similar patterns of relationship. In both cases, the soloist shows a slightly tighter relationship with the bass than with the

drums and a much looser relationship to these players than the section players have to one another.

The piano plays behind in relation to bass, leading the bass in less than half of the onsets (in 42% of bass/piano voicings) whereas in the DC Group, the guitar phrases ahead of the bass on 58% of shared events. At three short points in the solo, the piano does go into a more consistent 'ahead' feel and these are at bars 7, 8, 25, 26, 31 (final beat), 32 and these pushes are indicative of structurally expressive playing in that these six bars appear at transition points - bars 7,8 being the end of the first 'A', 25 and 26 signalling the beginning of the final 'A' and 31, 32 being the final bars of the first chorus of this solo. It is possible that each of these (more or less) 2 bar phrases are expressive of transition. Interestingly, the only transition that is not marked by 'aheadness' is that into the 'B' section of the chorus which is the single transition point within the song form that is strongly marked harmonically; the remaining transitions all move from 'A' to 'A'. Apart from these bars, individual instances of the piano appearing ahead of drums and bass do not seem to be indicative of structural expression or systematic phrasing.

In summarising this description of ahead or behind, it is important to bear in the mind the relational nature of these descriptions. There is no metronome against which this subtlest of shifts can be measured and of course these changes in asynchrony between players cannot necessarily be ascribed to the changes in the soloist's phrasing. These shifts could also be put down to any changes in position effected by one or both of the other players.

However, the timing data of the rhythm section, showing the tendency of the rhythm section to remain in a more consistent time relationship with each other, supports the view that the soloist is responsible for such shifts. The tendency of the soloist to animate change in their ahead/behind positions is also reflected in

the ways that soloists tend to describe their playing. The pianist and bandleader, SC, is seen by the bass player in the group as having a more varied relationship to the rhythm section than the internal timing relationship of the rhythm section. In answer to my question about where he perceived the pianist's 'place' in the temporal scheme of things, he replied

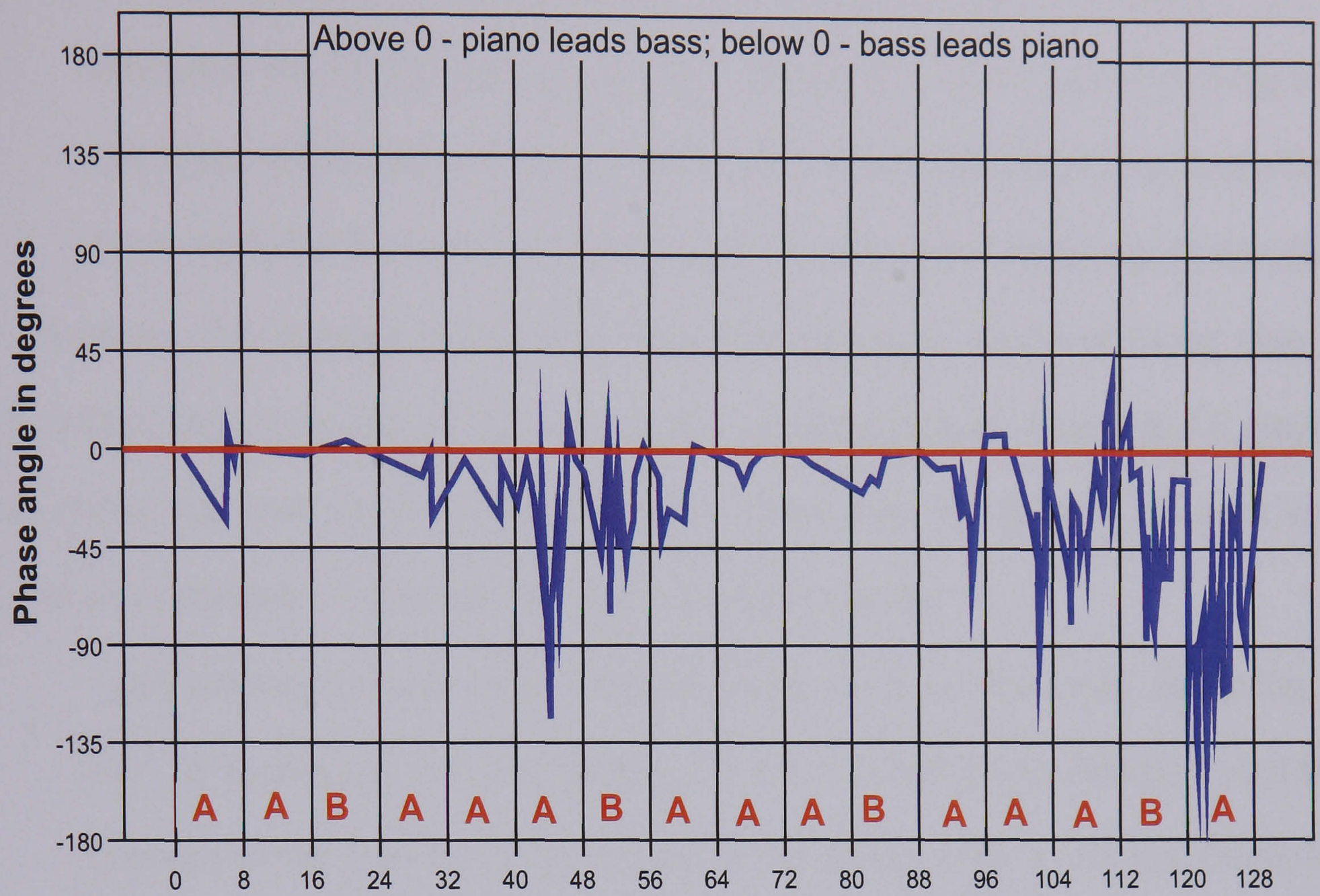
> 'in my experience, that can vary. It's pretty good …I think that it's dependant on tempo' (12.04.07).

JD Trio – 'Evidence'

Table 10. gives the descriptive statistics for the soloists' asynchrony with bass and drums, expressed in seconds.

	N	Minimum	Maximum	Mean	Std. Deviation
Piano/bass	143	-.044	.133	.035	.030
Piano/drums	143	-.029	.105	.030	.026

Table 10. JD Trio – Descriptive statistics for pianist/bassist asynchrony in seconds.



Graph 8. JD Trio – linear phase plots between piano and bass.

Graph 8 shows the timing between bass and piano over the course of the piano solo. Within this trio, the bass shows a much more consistent relationship to the piano than in the other two trios. In this example, the bass leads the piano throughout the extract except for 15 events; on the 15 events in which the piano does lead, the phase relationship is very narrow in contrast to the broader asynchrony on events when the bass leads the pairing.

Summary statistics reveal a further difference between the soloist/rhythm section relationship in this group and the other two groups. In this trio, the Standard Deviation for each pairing is very similar at around .026 - .030s suggesting a pattern of micro-timing interaction between each of the players that is very even. This trio is also distinct in that the closest soloist/rhythm section relationship lay

between the drums and piano. Drummer AS talked of his playing relationship with pianist JD in unusually positive terms. In his own words, he described it as,

> 'a very primary communication…the communication between us is effortless, it's not something that I need to work on or it's not something that had to be developed over a period of time…it was something that was there 110% from the moment I met him…and it's very rare, I must say' (12.01.07).

In particular, this playing relationship was informed by a sense of being able to play with a certain degree of risk without fear of being judged. Although AS played with many fine musicians, he felt that often there was too great a concern with music as a 'concept'. In his words, such musicians can be

> ' very concerned with what they are going to do or what they are going to say…preoccupied with themselves a lot and thinking very deeply about the concept of the music and the artistic things there. With J., it's just there; it's all there but with no thinking, with no talking about it' (12.01.07).

AS clarified this by going on to distinguish between the 'systems, concepts and practising' as secondary components, peripheral to the central concern of music making as communication. He saw in the pianist's playing, something that for him came close to, if not an ideal, then a very positive process. This sense of communication is examined further in Chapter 8 with reference to groove. In the musical extract from which these timings are taken, there is a considerable amount of interplay and rhythmic freedom between the soloist and both rhythm section players. The degree of trust that AS felt as he played with this soloist clearly contributed to the interplay between them and is perhaps suggestive of the close timing profile between them.

The pattern of being ahead/behind between bass and piano seemed to confirm somewhat the pianist's sense of the bassist having the ability to pull the music along. Although in the pianist's view, the bassist and the drummer both played fairly 'centrally', he also described how occasionally the bassist could play 'really, really strong...dragging the music along' (09.01.07). There was an interesting divergence between the playing position of the pianist in relation to the other two players as recorded in the timing data and in the comments of the musicians about the pianist's playing. JD saw his own playing style as 'tending towards the front, rather than having a really wide beat and sitting at the back of it' (09.01.07).This description chimed with the thoughts of the bassist, ST, who described his playing as having

> 'a really strong feel...the swing feel he has is really good; it's kind of, just a very contemporary thing, even-ish but with a lot of propulsion; it's difficult to describe' (16.01.07).

In the timing data, shown graphically above, the tendency of the pianist was to place his notes slightly behind the other two players and this was very consistent throughout the extract.

6.6 Player pairs' timing relations - summary

At the beginning of this chapter, the individual players' timing profiles were examined, linking these to their development and experience. This second part has been devoted to the entrainment relations between player pairs. These relationships were explored particularly through the role that the musicians occupied within the group. The soloist/rhythm section and intra-rhythm section

dyads provide a graphic illustration of the way in which different roles are implicated in the subtlest levels of entrained behaviour between players.

The demarcation between the two levels of role in the jazz trio has been explored in terms of the contribution to creativity and the tension between group/individual needs (MacDonald & Wilson, 2005; Monson, 1996). The emphasis here has been on the temporality and feelings about temporality in connection with role. The rhythm section players on the whole enjoyed a tighter timing relationship than did the soloists with the rhythm section counterparts. This was explicitly shown in the circular descriptive statistics and summary plots. This tighter coupling reflects rhythm section players talking about timing as a thing to be worked on and the importance of providing a quality 'environment' for the soloist.

The single most striking relationship was that between DC and her rhythm section. While the other soloist/rhythm section pairings remained reasonably congruent, this extract showed huge temporal shifts between the players and this was reflected in the way that the soloist spoke of her soloing aesthetic of pulling the time around. Her rhythmic freedom was such that at various moments in the solo, her relationship to the bass veered between in-phase and out of phase. Only from measure 43 to the end does the coupling remain within about 45°. The way that the musician talked about this suggests that she remained perceptually coupled with the other musicians throughout, however, she deliberately pushed and pulled the time in relation to what she described as an 'inner sense of time' (12.01.07). An intriguing picture develops of temporal relations as existing not simply between players but between players' hands and minds.

This raises the question of the degree to which musicians are aware or not of their temporal relationships. The link between the musicians' perceptions of their timing together and what appeared to be happening in the timing data varied. As

discussed earlier in the chapter, the reasons for this are difficult to assess. In part, the difficulty for musicians in making accurate judgements about their playing must be gauged against the timings between players lying around the threshold of aural perception. Although the way in which musicians talk about timing indicates that they are highly sensitised to it, in the course of performance, they are having to deal with a considerable cognitive load and this may well have an impact on their making judgements about such liminal matters.

The emphasis on these playing relationships has been very much directed towards temporality but in playing together, these musicians are engaged in an activity that cannot just be described in terms of timing properties. If there is meaning in what they do, then these timing relations also need to be considered in light of social dimensions to playing.

One of the dimensions to playing with others that came out in talking to these players was the sense of responsibility and authority involved in playing good time. Competence on one's instrument was only a part of fulfilling the requirement to groove and this goes back to the comments made earlier by bassist ST about the distinction between having good time and communicating that good time.

Pianist JD spoke of the relationship between playing well and one's perceptions of the professional standing of those you are playing with. Having worked with a large number of top American players over a number of years when JD lived in the United States, he was aware of the tendency to hold back with players that he perceived to be in a 'higher league' than he was. This reticence took the form of his not stating the time sufficiently strongly and underplaying,

> 'It might be it's just an age thing, just an experience thing, an awe thing…for me I'm sure that rhythm comes into it - if you're nervous and not confident , you are going to play everything underplayed' (11.06.08).

As JD worked with the same players over numerous occasions, then his ability to play with confidence increased,

> 'We did a couple of gigs with EH [*well known American player*] earlier in the year in Southport; the first one was a bit tentative and the second one was steaming so everyone's confidence just went up after the first gig in, so I think that is the way it works for me' (11.06.08).

Bassist SL also spoke of a specific occasion when he all but lost his ability to keep time when playing with a pair of well-known musicians; as he put it,

> 'I could barely play the root note on the first beat of the bar, I had no authority with those two whatsoever…it was so hard to kind of, to really put anything out there and be strong because, you know, who am I to presume where the time is with these two…and it just fell to pieces' (12.04.08).

It is hard to imagine a more vivid example of the tight fit between social awareness and embodied sounds.

This awareness of one's position in the hierarchy was tempered for this player by a responsibility for the music making. If one was too wrapped up in whether players were 'better' or 'worse' than oneself, then this could be damaging. Although these feelings might be there, for SL, he didn't like the idea of making judgements about other players as the basis for one's own playing, particularly if one were in the company of less experienced players,

> 'I don't think about that while I'm playing, 'cause I think that could be damaging really, to switch off and to think 'oh this guys not on it, let's just forget it' (12.04.08).

So there was a moral tone to his understanding of one's responsibilities for timekeeping when playing with less competent players. It was also clear that any

hierarchical relationship was based on a playing meritocracy, further underlining the difficulty in isolating social relations and timing behaviours within groups of musicians.

6.7 Group tempo

The final part of this chapter expands the focus from the timing between player-pairs to the tempo stability of the group within these extracts. Tempo describes the rate of successive events for the whole group over extended periods within a composition. Having 'great time' as a musician is composed of no single attribute but for rhythm section players particularly, it includes the ability to maintain a clear and unwavering tempo.

ST, bass player with the JD Trio, explained that although there are many ways to break up the concept of time in music, he had found it useful to distinguish between the strength of someone's time feel and then the sense of tempo; he recalls that he did not always have the two sides well integrated,

> 'I think I possibly did have a strong time feel but my tempos, my feeling of tempos was rather different……I think I had a tendency to drag' (16.01.07).

DC mentioned her own inner ideal musician who can 'play anything, improvise over anything in perfect time' and significantly added, 'with anyone else!' (12.01.07). Many musicians would acknowledge this inner ideal of an imagined musical superhero who can maintain flawless time whatever the circumstances and whoever they are working with.

More than for soloists however, there is a particularly strong sense of duty on the part of rhythm section players to create a timing framework within which the musical conversations can flourish and these were highlighted in the comments of many of the players through this chapter. SL talked of always being conscious of how his time is working within the group and spoke of a duty 'to make sure that the music feels good; it's grooving, it's in time, it's not slowing down, speeding up and to keep it feeling right' (12.04.07).

The effect of the tempo rushing or dragging is not necessarily felt in the same way at all tempos and at certain tempos the effect may be benign. SC commented,

> 'Faster tempos, I think it's fine if they push up a bit. If it's really slow and it slows down, maybe that's not so bad, you know, really, really slow as long as it still has got that sort of swing but medium things that slow down are horrible' (12.04.07).

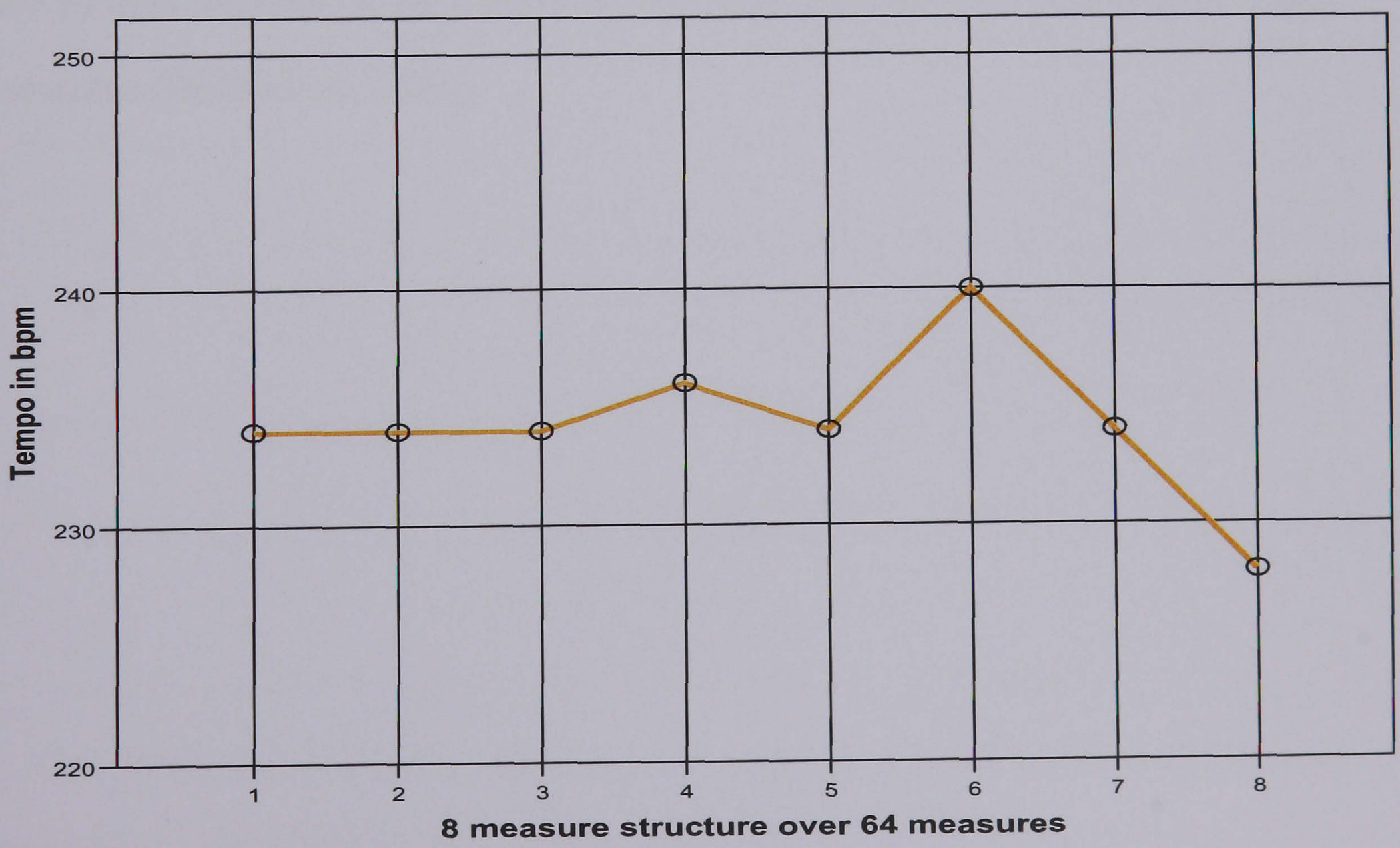
My own anecdotal experience from talking to players outside this study is that the general attitude towards tempo change is one of greater tolerance for an increase in tempo but not generally for the reverse.

In the following graphs, each of the extracts has been divided into sections lasting for 8 measures and tempo was measured for each of these. All of the extracts are structured in multiples of eight; for the two jazz standards, this division accords with the compositional structure AABA. Jazz composition tends to work with these groupings and players' absorption of 8 measure forms is evident in 'Slippers'; although the guitar solo was conceived as an open ended section, in this performance the players intuitively played a 64 measure form with two chords, each alternating in 4 bar sections. So between these differently structured pieces, the 8 bar format allows for a common division of the tempo grid which follows the harmonic structure of the pieces.

Where possible, all the absolute timings from which the tempo was measured were derived from the bass timings. This was partly due to the bass showing less variance in timing in all three trios and also because in two of the three performances, the bassists played quarter note walking lines which mapped easily onto the 8 bar structure. In the JD Trio, the bassist only adhered to a walking line at particular points in the extract. For this reason, three out of sixteen quarter note samples were supplied by the other players onsets at structural points where the bass was not playing and in two other cases, an estimated time was used by taking the subsequent bass onset and deducting the mean quarter note IOI of the preceding section, thus providing an accurate estimate of the missing beat.

Tempo plots for each trio over 8 measure sections

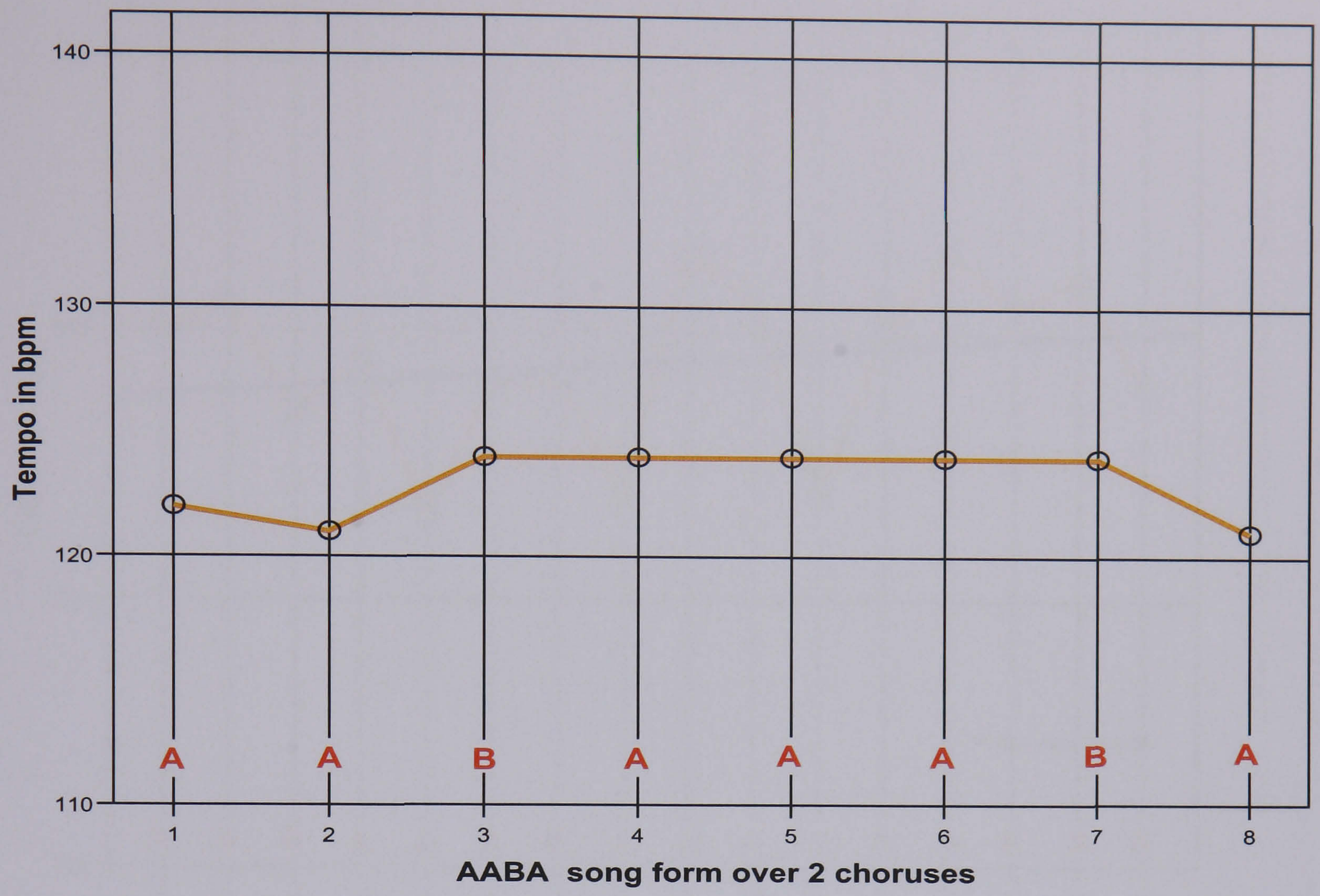
DC Group – 'Slippers'



Graph 9. DC Group – tempo plot.

Graph 9 illustrates the tempo profile per eight measure segment over the guitar solo extract. With a mean tempo of 234 bpm, the group maintain a more or less constant tempo over the first 32 measures showing only a change of 2 bpm in the fourth section. In the second half of the extract, the tempo variation is much more marked. There is an increase of 6 bpm in the 6th octile, ending at 228 bpm by the end of the solo. The tempo range in the second half of the solo is 12 bpm. There is an interesting divergence here between the tempo over these segments and the wide variation in timing shown by the soloist. The tempo is most stable in the first half of the solo when the guitarist's playing is most variable; in the final 24 measures of the solo, the guitar becomes steadier in relation to the rhythm but the tempo begins to become less stable and decreases in the final 24 bars. It is not clear why this should be so. The stability of the tempo against the variability of the solo points to research into entrainment within funk which has pointed to the tendency for the time to be stable at the hyper-measure while the there is considerable deviation at the beat level, suggesting entrainment occurring at larger timescales (McGuiness, 2006).

SC Trio – 'There is no greater love'

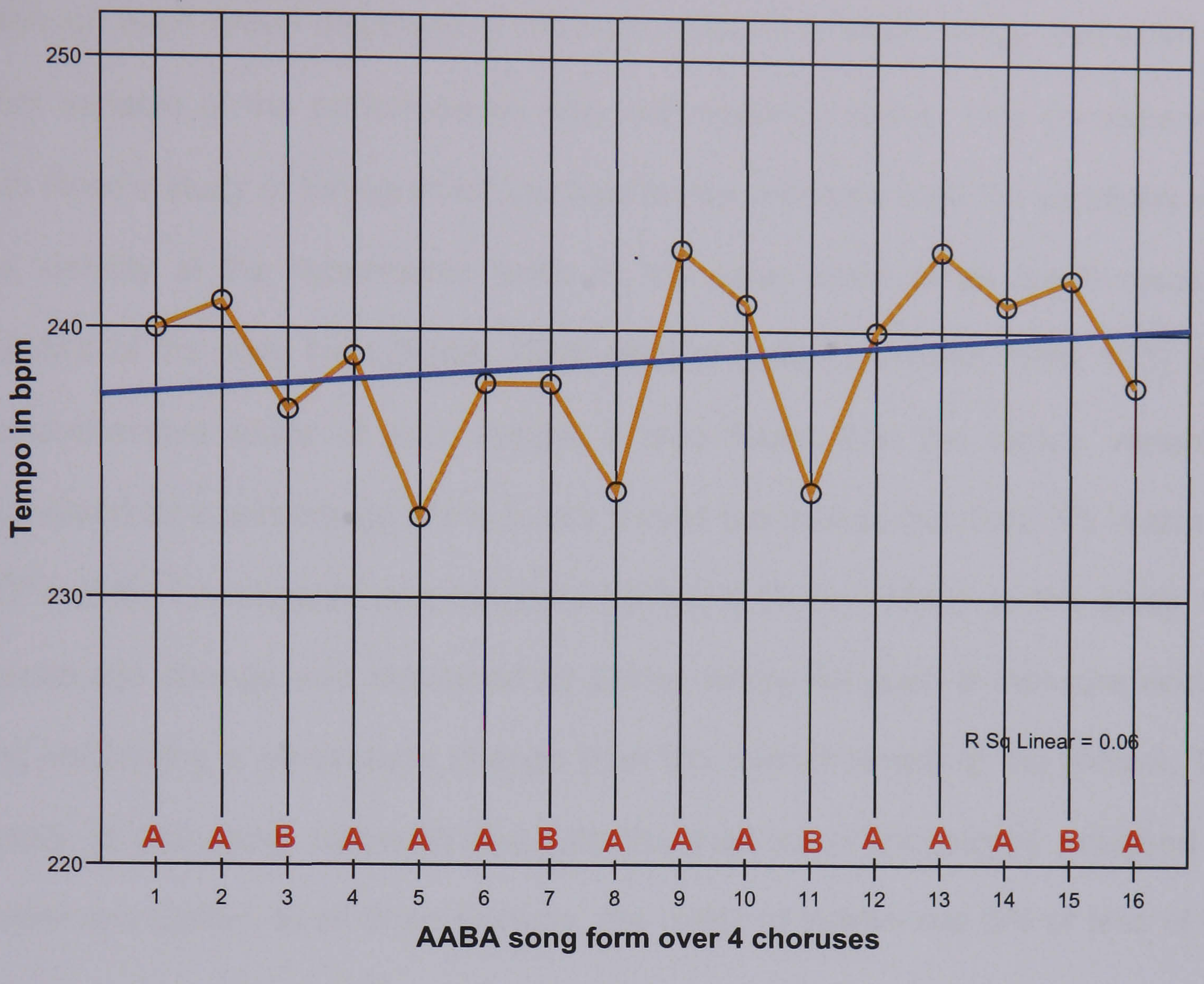


Graph 10. SC Trio – tempo plot.

The mean tempo over the piano solo from 'There is no greater love' is 123 bpm, almost half the tempo of the guitar solo in 'Slippers'. The range of tempo across the segments is 3 bpm. The shape of the tempo curve, shown in Graph 10, displays considerable stability from the first B section through to the second B, 40 measures in total. There are two mild dips in tempo - in the second A section and in the final A of the solo when the tempo dips to 121 bpm.

The group play at a very stable tempo throughout the two choruses. There are a number of possible explanations but it seems likely that the tempo falling within the range of maximal pulse salience and less busy playing from all the players may enable them to 'sit' at this tempo more easily.

JD Trio – 'Evidence'



Graph 11. JD Trio – tempo plot showing linear regression.

The final trio's tempo is measured here over 128 measures – twice the length of the solos in the other performances. Mean tempo for this extract is 239 bpm and the range of tempi is 10 bpm. For ease of examining the overall tempo change, a linear regression line has been added to Graph 11; this was not felt to be necessary in the previous two graphs.

No clear structural pattern emerges within the variability of the tempo except that the overall tendency shown by the regression line is an increase over the four choruses. It is noticeable that this extract is the most rhythmically disruptive of the three and this may in part account for the changeability of the tempo.

Summary discussion of tempo for all three trios

Although each group displayed a different profile, it is worth noting that even the most variable of the performances was still relatively stable. This corresponded with Rose's study of timing which contrasted the relatively high IOI variability with the stability at the hypermetric level, in this case taken to be the 8 measure sections of the song form (Rose, 1989; cited in Collier & Collier, 1996, 123). In a comprehensive study of jazz tempo, it was found that the tempo variability expressed as a percentage of the tune's overall tempo was less than 5% in around 2/3rds of the investigated jazz numbers (Collier & Collier, 1994). In this study, the percentage change was measured by taking tempo for each 8 measure section and calculating a percentage change from the overall tempo of the extract. The results in this study corresponded with the majority of the pieces analysed by Collier and Collier. In all three extracts, the range of tempo was 5% or less of the overall tempo of the extract.

Trio	**Variability of 8 measure segments as percentage of overall tempo**
JD Trio – 'Evidence'	4.5% (overall tempo 239 bpm)
SC Trio – 'There is no greater love'	2.5% (overall tempo 123 bpm)
DC Group – 'Slippers'	5% (overall tempo 234 bpm)

Table 11. Tempo variability over 8 measure segments as percentage of overall tempo.

Difference in tempo variability between songs has been explained as a function of tempo itself and song style. In Collier and Collier's study, it was found that slow tempi yielded greater variability. However, in this study, the slowest number, 'There is no greater love' was the least variable even though it was played at

around half the speed of the other two pieces. Collier and Collier also found that older styles of playing tended to be more stable in tempo than more contemporary styles and this may be the key factor here, 'There is no greater love' being played in a largely 'retro' rhythmic style.

6.8 Summary

In the data so far, I have explored the musicians' timing as individuals, as relational pairs and as the group's expression of overall tempo. Along with this performance data, I have presented the musicians' own understandings of musical timing and their approach to these different aspects of temporality.

At this point I want to summarise the data in relation to the idea of entrainment. The notion of entrainment as a coupling between independent oscillators was explored theoretically in Chapter 3. In this chapter, the timing relationships between pairs of players were explicitly examined using entrainment research methodology. Entrainment has been shown to be a powerful overarching theory for temporal and social engagement. From a cognitive viewpoint, the entrainment of neuronal cell assemblies to external stimuli offers the most plausible account of the dynamic way in which humans can lock in with rhythmic processes and proposes that this is accomplished not via passive reception but active attunement. Such attunement becomes audible in musical rhythm and visible in the periodic movements of musicians as they synchronise with metre and the movements of others even when these may be beyond their awareness (Clayton, 2007a).

The timing data from this study shows that timing between player pairs appears as a flexible attunement which though subject to disturbance, retains its cohesion; in the playing of one of the soloists (guitarist, DC), there was a dramatic demonstration of the soloist seemingly going 'out of time' yet always coming back to greater synchrony. One of the tests of entrainment is just such a capacity, that is, to withstand perturbations in one or more of the oscillators and yet not be uncoupled. In all the trios, the relative phase between pairs of players could be extremely wide but always returned to a closer state of coupling and the mean vectors for 5 out of 6 pairs suggested that although the coupling was very elastic, the overall direction of the mean vector pointed towards considerable synchrony.

In Chapter 3, entrainment was also discussed as a mechanism for a primary human intersubjectivity. This was traced back to our developmental origins and it was suggested that musical entrainment harked back to this foundational experience. Although the musicians in this study enjoy a thoughtful and committed relationship with musical time, it emerged in this chapter that their reflections on their timing and those of others could frequently be at odds with the objective data. At first glance, this suggested that their insights may be less than useful. However, I feel that this divergence between objective timings and subjective experience may simply reflect the primary nature of this intersubjectivity; the wordless experience of being in time together is one that is difficult to precisely articulate. At this point, it seems clear that entrainment processes are at work for the musicians by virtue of their remaining coupled despite disturbance; the question of how entrainment can model groove as a group quality will be examined later in Chapter 8.

This chapter also raised important points in beginning to clarify the nature of groove. From my interviews, it was clear that the musicians felt good about their

performances on these pieces. Some had critical comments about aspects of the playing such as their improvising but in general they used positive language about the felt temporal quality of these performances – what for now, we might term the groove. But as was made clear in the Introduction, groove is defined in no single way. How did the players' timing and their roles fit into the clarifying of groove?

Firstly, I looked at the way in which players talked about their individual development as timekeepers. Individual players' timing variability appeared in part to be a function of role. The bassists as a group all showed the least variability in timing and two of the three soloists showed considerably more variance in the timing than rhythm section players. I proposed that levels of experience may have played a part in the individual profiles.

At the beginning of the thesis, I suggested that time in jazz is partly distinguishable from groove by its being a description of individual players whereas groove was always felt as a relationship. In looking at the relations between pairs of players, I took the first step towards understanding this relational aspect of groove.

The relational profiles of player-pairs in the rhythm sections were distinct. One drummer, BB, unambiguously led the bassist, the rhythm pairing in the SC Trio shared the lead more or less evenly and the third drummer, AS, tended to lay behind the bassist but not throughout the extract. Within these overall profiles, there was also considerable variance in the relative 'spatial' positioning of the players within the course of the excerpts. There was also a core degree of consistency in the asynchrony between rhythm sections; the circular statistics showed a very low level of dispersion from the mean (displayed as high scores in the mean vector length) for all the trios.

The temporal picture for soloist/rhythm section relations was different to the intra-rhythm section profiles. Again, each profile was distinct. The pianist, SC's playing

relationship with the rhythm section was very tight and at the other end of the spectrum, the guitarist DC, displayed a very free rhythmic approach to soloing which saw her go right out of time with the rhythm section at certain points.

Clearly, musical role has some part to play in timing. Not only is this reflected in the temporal data but also in the reflections of the players. Rhythm section players saw their role as being temporally supportive and rather more constrained than soloists and this was evident in their microtimed behaviours.

But what do these data begin to tell us about timing, entrainment and their relationship to groove. At this point, it suggests that there is a relatively wide bandwidth for these jazz musicians to play in as they entrain together and the different playing relationships shown in the data did not suggest that there was one way of being in time together. Although there is no doubt that timing is connected with groove, these results showed that there is no single way of being in time together and there may be no single way to feel groove.

Some researchers have focused on groove as the preserve of the rhythm section (Monson, 1997) and it is clear that the rhythm sections, whose role is understood to be more connected with groove, showed a generally tighter playing relationship. It could be argued therefore that one need look no further for groove than in the rhythm sections in this study. I think this is an unnecessarily restrictive approach. While it is emerging in the data that musical roles contribute differently to the temporal feel of the music, I will argue that the picture of groove that emerges in this study is to be explained in terms of the group and not a part of the group. In the following chapter, I discuss the various temporal models that make up what these players need to know in their working towards groove as an aesthetic.

7 Three trios – cultural models at work

In the previous chapter, the emphasis lay on the way in which jazz musicians experience time between them at a level of milliseconds. This dynamism at the micro-level was explored through the way in which musicians are entrained together and the elasticity in that entrainment becomes part of an expressive palette for the musicians as they made sense of this temporal communion. While the fine detail of temporal performance, measured in milliseconds, gives a picture of the subtle fundamental entrainment between players, this represents a necessary but insufficient contribution to the understanding of groove.

This level of shared temporality underpins a more overt, structured intersubjectivity, that of the temporal models in the music which are themselves a significant part of groove. In this chapter, I explore the shared models which musicians use in these performances, set out a taxonomy of such models, and discuss their significance.

The words and performances of the participants in this study, combined with the ethnographic, biographic and anecdotal literature, suggest that there are a range of temporal models which correspond to the shared cultural models as conceptualised in cognitive anthropology; such models were discussed in Chapter 4. It is not my intention to set out an exhaustive classification of concepts and musical patterns which may appear in jazz but rather to focus on those that appear within the recordings made in this study and are of significance in looking at shared timing.

The models that are presented here all heighten, diminish or perhaps more accurately inflect the 'locked in' feeling that appears to be a key to the understanding of groove. In a similar approach to that of Shore (1995) whose theorising of cultural models was explored in 4.2, I understand the temporal models that appear in jazz as exterior, shared sonic models having a range of functions and associations. The taxonomy of these models is set out towards the end of the chapter but beforehand, I want to describe two broad model types that I describe as **overt** and **covert** that appear particularly significant in looking at the structures of groove. Overt models are the main focus here and are taken to be those that are employed by the musicians as part of the musical surface (such as the *2 and 4* model mentioned in 4.4). Covert models are implicit, rather than explicit in the musical structure – such models include song forms and metre. I devote considerably less attention to these as they contribute less directly to groove but nevertheless are important in establishing a taxonomic basis of shared timing.

7.1 Overt models

Within the group of overt models, I look at models that could be said to be most iconic of jazz rhythm; the walking line played by bassists, the ride cymbal pattern of the drums, and the 2 and 4 accents. These are all characterised in this study and in relation to these extracts as **proximal** models. In using the term 'proximal' to describe this group, I am conveying how these tend to align with the underlying tactus, thus supporting the felt pulse of the music. I then go on to look at **distal**

models, those which tend not to reinforce the feeling for the underlying pulse; such models are typically described as polyrhythms.

7.1.1 Proximal models

The walking bass

In looking at proximal models, I begin by focusing on the sounds of the bass. Lying at the bottom of the sonic field, the bass is regarded as the foundation of the sound (Monson, 1996, 29). The very name of this model implies the locomotive, four beats to the bar rhythm of this model. Its development is central to the role of the bass in contemporary jazz and its usage is attributed to the decline of stride piano in which the left hand fulfilled a similar function to that of the bass.

This sort of pattern functions in a variety of ways within the group. Firstly, it acts to convey the basis of the harmonic structure to the piece and to support the soloist as they negotiate the 'changes' [22] but from the point of view of groove, the walking bass acts as the anchor for the more interactive rhythmic elements which take place between the other members of the rhythm section and soloist.

The development of jazz is in part a description of the manner in which the different instrumental roles have become more fluid. Although one could see similarities between modern rhythm sections and those of seventy years ago when the music flourished as a more mainstream musical form, the key distinction lies in the more interactive framework within which improvisation takes place. The rhythm sections of today tend to be more co-participants in the development of a solo. However, this inclination towards a freer role within the music is not mandatory in contemporary playing and not always welcome.

Within these three excerpts, the performed bass lines illustrate the use of the *walking bass* model and its flexibility within performance. In 'Slippers', the bassist plays a continuous walking line with no embellishments over 64 measures. There are a number of possible reasons for this unadorned approach. Firstly, the guitar solo over the rhythm section is within a piece that is already highly irregular, its largely being played in 15/8, so it may be a sound compositional strategy to balance the relatively angular patterns of the majority of the piece with a straightforward walking line. Secondly, the bass enters after a period of a highly interactive guitar/drums duet in a double-time jazz feel and at this fast tempo, the bass needs to enter simply and strongly, otherwise the solo would be in danger of losing momentum.

The bass lines that SL employs in 'There is no greater love' contain a greater degree of embellishment but nonetheless conform to a modern-mainstream aesthetic of driving the rhythm section and laying down a strong line to underpin the soloist. A rhythm extract from the bass line (pitch is not shown) shows a couple of examples of this strong walking line, interspersed with swung eighth notes.

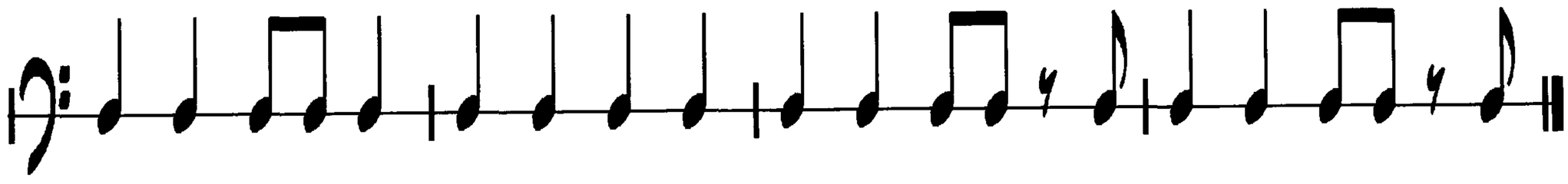


Chart 2. Rhythm transcription of SL walking bass line from 'There is no greater love' (measures 31-34).

This instance of the model captures the salient parts of a straight walking bass line that also includes offbeat and swung eighth notes. As mentioned in 6.2, SL talks of 'putting my Ray Brown hat on' (12.04.07) in this performance; in this case, SL also talks of working towards a big supportive sound on this number,

> 'so I'm dropping right down to the bread and butter end of the bass and just trying to get that big sound out to give this sort of giant spectrum of music with a very solid grounding...because of the tempo and where it is, I am bringing out that big bass sound – I've got the time, you know' (12.04.07).

The sense of this player's responsibility in providing a strong foundation to the overall sound comes over very clearly in those comments.

Often contained within this sort of walking bass line could be the *2 and 4* model outlined in 4.4 which is communicated through different levels of intensity between beats 1 and 3 and *2 and 4*. This is dealt with a little later.

The work of ST, bassist with the JD Trio, illustrates how the *walking bass* model may be employed as a counterweight to more radical, interactive playing. In 'Evidence', the walking bass line emerges periodically through the excerpt (measures 48 – 55, 81-86, and 97 through to the end with occasional rhythmic interjections) and is set against rhythmic riffs and passages of polyrhythmic playing from the bassist.

The following example gives a snapshot of the range of rhythmic devices that the bassist employs.

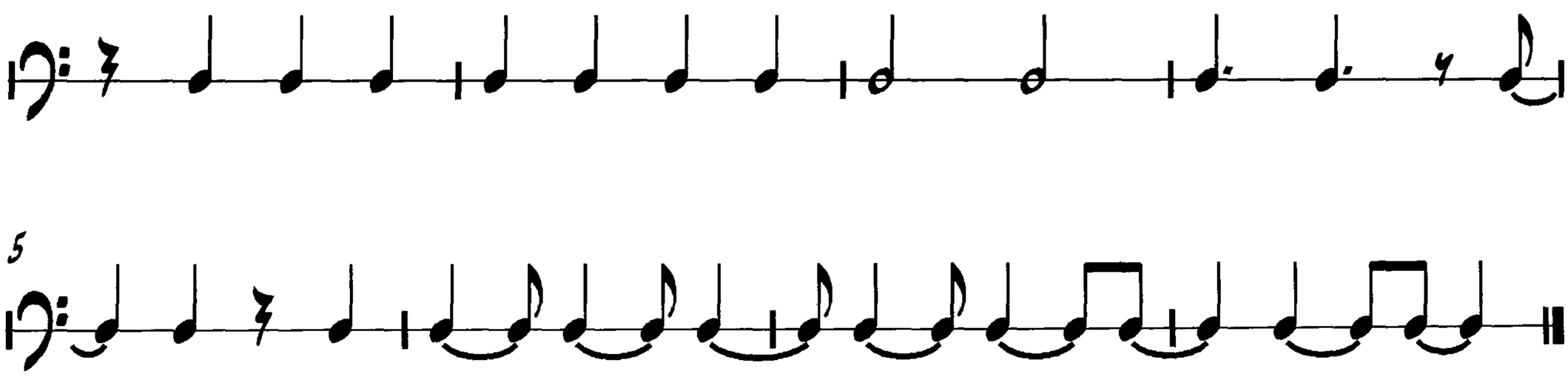


Chart 3. Rhythm transcription of bass line from 'Evidence' (measures 60-67).

Each of the three above examples gives an indication of the breadth of interpretation available to a bassist using the *walking bass* model. From a 'verbatim' rendering of the model by bassist, AR, to the performance of the model in the third example in which the bassist moves well away from the conventional walking line.

Ten to Ten

The walking bass line is a powerful signal of the jazz sound but also integral to this sound is another proximal model that defines the drumming style of much of the music; this is the repeated pattern played on the ride cymbal, which is affectionately referred to by many jazz musicians as *ten to ten*, a mnemonic which has a strong onomatopoeic quality if repeated quickly.

This pattern when combined with the *2 and 4* model sounded on the hihat is the pattern that would be most associated with the drum kit in jazz playing.

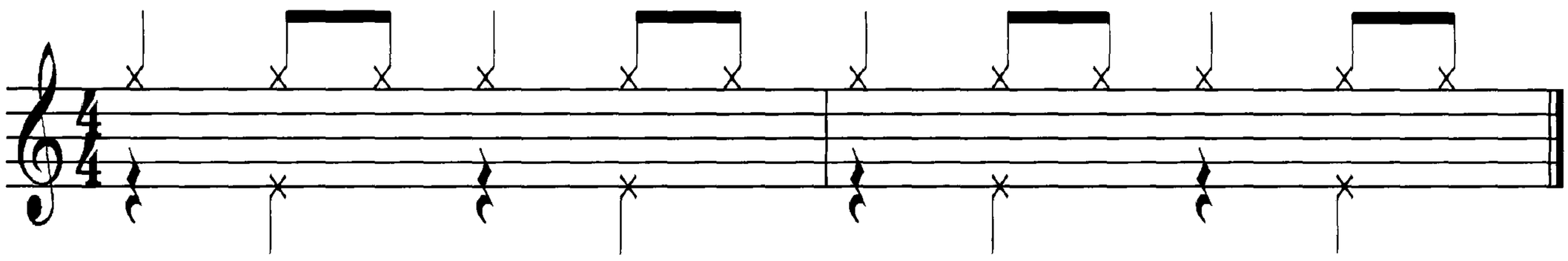


Chart 4. Standard drum pattern combining two temporal models *ten to ten* and *2 and 4*, played on the ride cymbal ('g' on the staff) and the hihat (low 'e' on the staff).

In a similar fashion to the *walking bass*, the *ten to ten* model is played with degrees of adherence to the archetype cymbal pattern shown above.

None of the three drummers in these examples stick fully to this pattern and each reference it in different ways with rather different purposes. TS, the drummer with

the SC Trio, combines the *2 and 4* model with *ten to ten* to deliberately set up a rather 'retro' feel. This a subtle indication of the intertextuality that musicians actively engage in to set up moods and conditions for the other players. While intertextuality encompasses the overt 'quoting' of other players and other melodies that soloists routinely engage in within a solo, this is an example of a broader stylistic index that musicians may utilise to set up the framework of a solo or entire piece. Much of the time, this sort of referencing may be relatively unconscious; it may be so woven into the playing of a musician that nodding in the direction of an era or 'house sound' (for example, ECM or Blue Note) may be done without reflective awareness. In this particular case, the pointing to an earlier era is quite deliberate. As TS says,

> 'Mid to late 50s, that kind of vibe is what I'm thinking. Also I guess I'm kind of thinking older drummers here, more big band drummers, you know, that were known for playing two and four like, one of my favourite drummers, Sam Woodyard' (12.04.07).

However, as the piano solo unfolds and becomes more polyrhythmic, so the playing of the ride cymbal (and the full drumkit) reflects this and moves away from the 'retro' style that was developed in the earlier part of the solo.

The cymbal playing of AS, during the piano solo in 'Evidence', is very broken throughout the piano solo and makes rather more radical use of the *ten to ten* model than TS in 'There is no greater love'. For instance, in measures 6-10 (Chart 5) of the first chorus of the solo, the drummer plays a *ten to ten* pattern but in half time,

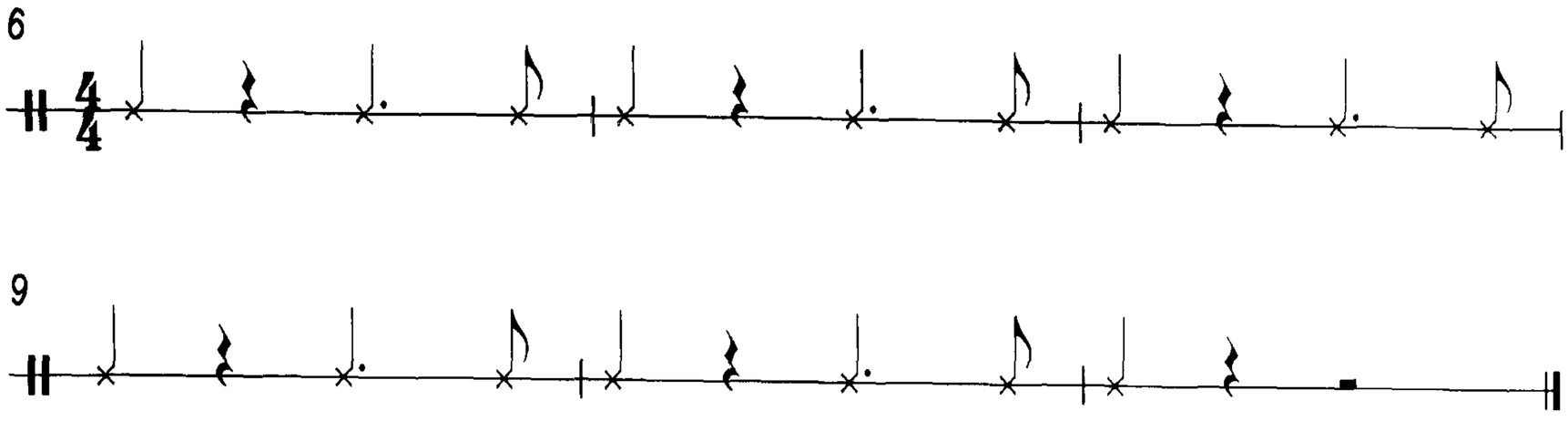


Chart 5. *Ten to ten* played at half time in 'Evidence'.

While the internal integrity of the pattern is preserved, the fact of it being played in half time (and also on the rim of the snare drum rather than the cymbal) more or less stands the *ten to ten* pattern on its head. Its use in this context especially seems quite stark and disruptive.

Both the *walking bass* and *ten to ten* models therefore played in their 'purest' form speak strongly of the quintessential jazz groove and are identified with the rhythm section. Relatively few models are as tied to musical role as the two examples given above but another key model for understanding how musicians feel groove is the *2 and 4* model. Like the *walking bass* and *ten to ten* models, it is deeply tied to the strong sense of coordinated, repetitive motion that features in groove but unlike those models, this cuts across musical role in the trio to the extent that all musicians make use of this model in their work.

2 and 4

The idea of *2 and 4* was briefly discussed in 4.4 with reference to the work of Zbikowski on groove. At this point I look at this foundational model as it appears in these performances and how it is meaningful for these players. Within the body of a jazz tune, the use of *2 and 4* within the groove can set up particular expectations and mood. Monson (1996) has commented on the way in which grooves set up

genre boundaries about what should and should not be considered as jazz. Even within jazz repertoire, the *2 and 4* can promote a sense of boundary in style; there is a strong relationship between jazz as 'high art' and the degree of flexibility in the groove. Put crudely, the further that the music moves away from dance and into the concert hall, the less regular and repetitive may be the rhythmic approach of the players. Monson quotes Jerome Harris in contrasting the difference between a jazz and R'n'B groove; both will probably be swung but much of the difference lies in the application of repetition,

> 'While the backbeat "has pretty much got to be there pretty consistently" in R & B settings, it "might be there sometimes but not all the time" in jazz.' (Monson, 1996 , 195).

The sense of *2 and 4* can be articulated in more than one way within the ensemble. Most obviously, this is achieved by an instrument simply playing these beats within the groove. In a jazz ensemble, the hihat within the drumkit (see Chart 4) typically plays this role, thus replicating the way in which the snare drum in much funk or soul music lays down a *2 and 4* throughout the song. However, the intensity of a walking bass line, the comping of piano and guitar and even the rhythmic emphasis of a soloist can all be used to strengthen or weaken the repetitive feeling of the *2 and 4*. Examples of this were given in Charts 2 and 3 above, in which the bassists moved away from the walking line towards more syncopated approaches and in so doing imply the *2 and 4* less obviously.

In a performance of the DC Group in London recorded in December 2006, there were numerous instances of the way in which the group and more particularly the drummer articulated this sense of *2 and 4*. During 'Slippers', the guitar solo moved into a fast swung passage in 4/4 for 64 bars before returning to the 15/8 section. Underneath most of the guitar solo, the hihat maintains a *2 and 4* pattern; the only

significant exceptions being in bars 49-54 where the hihat falls in with the overall polyrhythmic phrasing that the drummer briefly develops.

The almost constant repetition of the hihat in this section seems to perform a number of simultaneous roles. Firstly, it is part of a musical statement that the guitar solo is 'jazz' even though the remainder of the song is played within an even-eighths odd time feel, reminiscent of what is often described as 'fusion' [23]. The overt *2 and* 4 on the hihat also acts as part of the 'ground' over which both the guitarist and other elements of the drumkit can state the time in a more rhythmically complex way. While the hihat and bass line in this extract are conventional, the other elements played on the kit and the guitar solo are played in such a way as to reference styles outside of mainstream jazz. The drummer's use of the snare is both a complement to the rhythmic lines played by the guitarist but also acts as a way of suggesting other drum styles by the use of a strong backbeat on '3' of the bar, thus moving the drum feel into a much more funky [24] area. This is a good example of the way in which musical models can be layered together to form a complex rhythmic whole, in this case, suggesting a matrix of different musical styles. As BB commented,

> 'I am playing the swing but I am almost hearing 2 time signatures at the same time. At the same time, I can hear another layer [*sings a drum beat with a strongly accented 3rd beat]* so I am sort of dancing either side of that line…so I am playing swing but I am thinking in my mind of [*sings 3rd beat again*]' (02.07.08).

This description is characterised below in Chart 6 but note that this includes only the essential rhythms that are at work here (the drummer was also making use of grace notes and other adornments within this pattern)

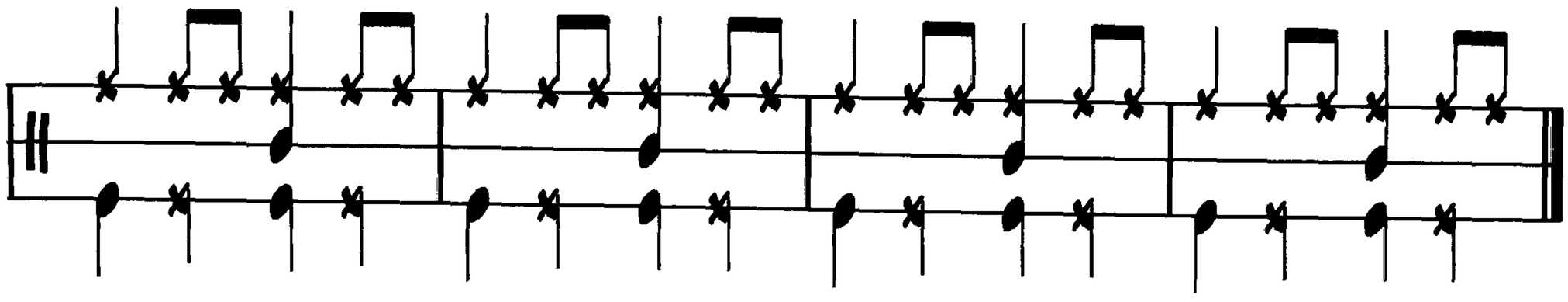


Chart 6. Outline of the multi-layered drum model used in 'Slippers'.

This layering of a strong snare drum on the backbeat (the 3rd beat of the measure in this case) on top of the primary jazz feel begins to suggest not only jazz, but hiphop, rock and so on. Such combinations of time feel are more subtly accomplished than Chart 6 suggests. BB made further points about such a layered model. Firstly, that he does not need to be very explicit with any of the separate components and such layering is a way of adding a flavour to the groove. The second point is the degree of conscious thought involved.

> ' I don't think I analyse what I play...I just hear in my head what I think would work...so I am not saying to myself, "right, I will play a hip hop thing."; it just comes out' (02.07.08).

So while the chart above and the description of these layers of model might suggest a digital chunk of musical knowledge that the drummer has objectified, when it is enacted by and between players it is felt by them as a much more procedural, analogic feeling about what should make up groove at any point. Bassist, AR, picks up this idea of the 'feltness' of such models when she talks of the subtle, embodied rhythmic emphasis that she feels on 2 and 4 almost as a counterbalance to the harmonic emphasis on 1 and 3,

> 'The 2 and 4 is important; I feel a slight emphasis on those beats, sort of like nodding my head on the 2 and 4 as I am playing...the 1 and 3 have

> more importance harmonically whereas the 2 and 4 have more importance rhythmically' (5.10.07).

As was made clear in Chapter 4 where I examined Zbikowski's analysis of a jazz groove, a temporal model does not simply exist as a musical device *sensu stricto.* As Zbikowski showed, the use of the finger click on beats 2 and 4 of a count-in serves to enact *2 and 4* and in doing so, not only sets the band's tempo but also is an indication to a knowing audience that the performance is about to begin and so the band require their attention.

DC, the guitarist and leader of the group, further exemplifies how such models underline cultural identity for musicians. Almost as an aside in an interview, DC remembered past performances and how 'people all clapping on 1 and 3 used to really make me squirm' (12.01.07) and she recalled how audiences often clap on the 'wrong' beats during a piece and its effect on her. Although clapping on 1 and 3 makes complete sense from a metrical perspective, DC said 'I think for me, I feel it in my body so it's not in the head; I do feel this kind of slight stress almost from that' (12.01.07), a stress born from the inappropriate behaviour of the audience. This is suggestive of the utterly tight relationship between a musical culture and the bodily feelings of the musician.

For most of the musicians in this study, the sense of *2 and 4* was a thread not only through a performance but throughout their development as players. In particular, this model was seen as a means of developing an appropriate time sense in the music. Nearly all the musicians talked of using the metronome in practice by hearing the metronome beats as being on beats 2 and 4 rather than on 1 and 3 which would be the standard classical approach to practising with a metronome (if not on all four beats of a measure). This is seen by many musicians as a given, a way of re-creating during practice time the sound of the hihat within the rhythmic

feel of the number. Anecdotally, musicians have also described to me the importance of working to 2 and 4 in practice through its obliging the musician to 'supply' the first beat of the bar and so in effect becoming more metrically aware.

Simple models such as the *2 and 4* can seem rather anodyne compared to the richness of a sax solo but on examination of its use within 'There is no greater love' by the SC Trio, one can see how in the hands of a skilled performer, such temporal patterns have considerable expressivity. In this number, the *2 and 4* model is subject to manipulation by the drummer. First there is a subtle change in the way that he highlights these accents at the beginning of the solo and gradually diminishes them but also in the way that he shapes the internal dynamics of the model through the solo. At the beginning, the feel is weighted towards the '4' by the extra placement of a cross-stick [25] snare on that same beat. This weight on the fourth beat is particularly apparent at the beginning of the piano solo but as the solo progresses, then the intensity is shifted from the fourth beat back to a more even distribution across the 2nd and 4th beats. TS, the drummer on this piece commented on the feeling of the accent on beat four, 'There's a wideness to the really definite beat on four,' (12.04.07) and he compared this to the playing of Sam Woodyard, Duke Ellington's drummer, and his use of *2 and 4* with an accented beat 4

> 'it's so big and so swinging…and that amount of air you know….there's a wideness to everything that's going on' (12.04.07).

Over the course of the piano solo therefore, the model itself is modulated and appears more or less highlighted within the musical surface. This is made clear by a comparison of intensity (dB scale) on beats 2 and 4 at various stages of the solo; in the first ten bars of the piano solo, there is a difference of between 6dB between beats 2 and 4 (the fourth beat showing the greatest intensity in each bar) but as

the players come to the B section of the song in the first chorus, the relationship between 2 and 4 has already smoothed out so that intensity is more or less equal. While the focus of this study is temporality, this example of intensity change points to the fact that all these models have significant non-temporal dimensions which may contribute to the musicians' sense of their appropriate usage and their relationship to other layers of the musical surface.

7.1.2 Distal models

Having looked at models that tend to suggest closeness, it seems central to an understanding of shared temporality to examine the ways in which musicians also use temporal models that are suggestive of a widening between players. Within the Black Atlantic family of musical genres, there is a strongly developed aesthetic of combining centrifugal and centripetal tendencies within a single framework (Pressing, 2002). In salsa, the repeating figures of a *montuno* will often be the consistent background for the broken, highly polyrhythmic fireworks of the *timbalero* [26] and at the heart of the jazz tradition is this same dialectic between musical forces pushing towards order or chaos. It is this precise tension which often marks out the most engaging performances.

Polyrhythmic models are apparent throughout the performances within this study. Such models are often associated with the work of the soloist when they engage in the rhythmic counterpart to the harmonic practice of playing 'outside the changes'. Within jazz harmony, the distinction between dissonance and consonance is often rather blurred. The degree of commonly heard dissonance has developed to the point where chords are routinely built using the higher extensions of the chord (that is including 9^{th}, 11^{th} and 13^{th} notes of the chord) and the melodic phrases of

the soloist will similarly be often at a considerable tangent to the basic triad. When playing outside is successfully negotiated, it can become a particularly vivid tension/release within the solo. In a similar way, the rhythmic extensions that players use to suggest other metric frameworks and create metric illusions have become a significant part of the temporal vocabulary of contemporary jazz musicians.

A small number of such models are used frequently by both soloist and rhythm section players in these performances. Here, I focus on the *dotted quarter note* model which becomes the basis for phrasing at a number of points in two of the performance excerpts for this study (other distal models will be dealt with in Chapter 8).

The degree to which the rhythm section engages with such rhythmic 'dissonance' is significant. While the practice of suggesting other metres has been common in soloist's phrasing almost since the beginnings of jazz, it is only with the advent of bebop and modern jazz that the rhythm section has begun to make considerable use of such phrasing. In the following example, the bassist with the JD Trio, ST, uses the *dotted quarter note* at a number of points within the piano solo.

Below I set out some examples from the bass part of 'Evidence' to show how the bassist goes in and out of such a model.

EVIDENCE – RHYTHM TRANSCIPTION OF BASS LINE, MEASURES 57–88

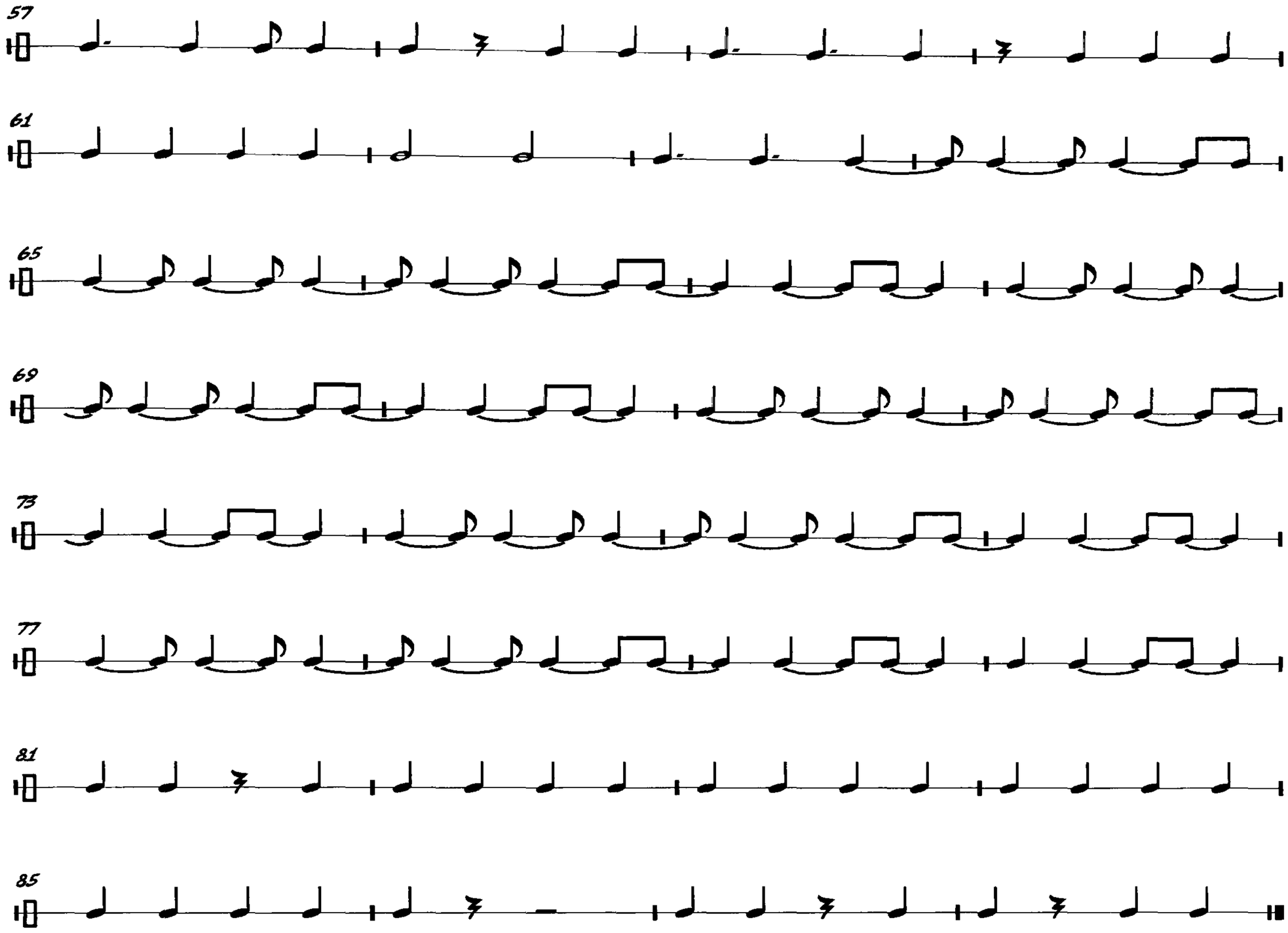


Chart 7. *Dotted quarter note* model used by ST in third chorus of 'Evidence'.

The extensive use of this model by the bassist in the piece begins on beat 1 of measure 65, the first measure of the third chorus. This model has a number of features that suggest a new tactus at a slower pace. The durations of the quarter notes in this piece are approximately 250 ms and so the dotted quarter note would be 375 ms duration. A dotted quarter note superimposed over the original tactus, as is the case here, not only appears to extend the pulse length but also suggests a disconnection with the primary tactus by only resolving to a shared beat 1 after three bars. In this example, the bassist plays this three bar figure for five repetitions thus coming back to the fundamental pulse on beat 1 of bar 16. In total, the dotted quarter note is repeated over 15 bars, virtually two 'A' sections of the third piano solo chorus. This prolonged departure for nearly 16 measures from the

established tactus towards a new sense of the fundamental time is a strong musical statement and is perhaps made stronger by its being stated by a rhythm section instrument, one that is normally committed to supplying a metrically conforming pattern such as the walking line.

This model may often be used in less dramatic ways that will not disrupt the sense of the tactus so markedly. In the same piece, the bassist uses the same device with the same starting point on beat 1 of the bar. In this second example, the implication of a new meter based on the dotted quarter is weaker as it continues only for four full bars and then is resolved half way through the fifth bar of the sequence.

EVIDENCE – RHYTHM TRANSCRIPTION OF BASS LINE MM 34–39

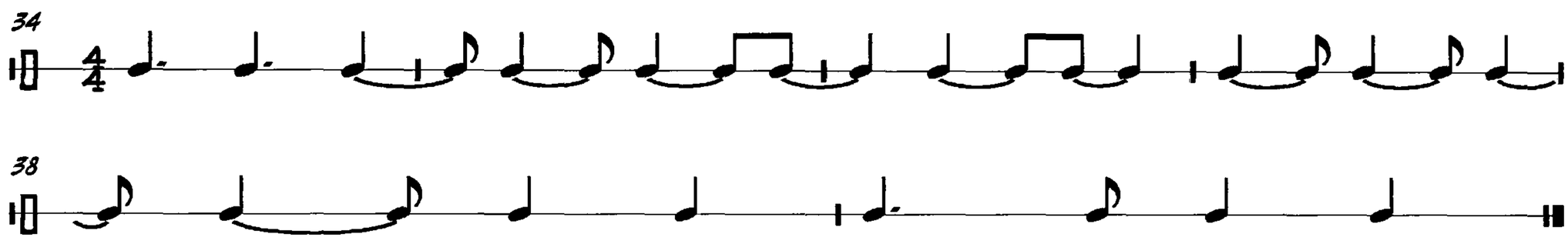


Chart 8. Second instance of *dotted quarter note* model in the bass part of 'Evidence'.

ST talked in some depth about the process of introducing a polyrhythmic line over the existing metre.

> 'it's a feeling of satisfaction…I am counting or thinking of the tempo of the time as it really is, and if I'm superimposing something over it, that is the subconscious bit of playing because if I go with the subconscious bit, I will lose the original which is pretty pointless because then you end up in the wrong place and that's disastrous, so what I tend to do is actually be thinking, be counting the important bit and the playing happens subconsciously so there are some things where you feel something that

> goes against the normal 4/4 count and but you just stick with it and as long as you keep feeling the bars [then] it comes out the other end and that's when it feels satisfying ...it is just the same with harmony, it's tension and resolution' (16.01.07).

His description of how he is able to maintain the illusion of a new metre reveals his superimposing a relatively unconscious action over the original tactus with which he maintains a connection through feeling the bars. The polyrhythmic pattern appears to be relatively distant from the centre of his attentional focus, a focus which becomes more intensely applied to the underlying beat (in this case the 4/4 metre of the piece). As a working musician, there is also a strong sense of the pleasure of navigating one's way through this aural Necker cube; if one loses the original pulse and goes with the superimposed rhythm, then as ST made clear, this can be fairly disastrous. This sense of potential failure is probably most acute in the rhythm section where the failure to come out in the right place may be personally embarrassing and may jeopardise the rhythmic coherence of the entire piece.

It is at these points in the performance where temporal models are introduced to alter the groove dynamics that 'derailments' can occur but when such rhythmic sleights of hand are executed correctly there can be a real sense of confidence and musical freedom. The experience of playing with more developed players was liberating for TS as he felt increasingly able to set up more challenging polyrhythmic structures on the drums,

> 'the other day, I got up and played at this jazz session and PD [*bassist on the London scene]* was on it and actually it was a real eye-opener for me because I had so much more room to breathe and actually I have got more

> together than I realised…PD was so on it that I can waiver slightly in either direction without it being a problem' (12.04.07).

This sense of being accommodated or accommodating others is foregrounded when the risk of losing the overall groove may occur. TS talked of the confidence he derived from playing with more experienced musicians who could handle the advanced use of polyrhythms. BB, the drummer with the DC group, spoke similarly of his being able to play polyrhythmic material with his current playing partners,

> 'I could play anything across the bar and it's not going to throw them, and DC quite often goes across the bar which is great…'(16.01.07).

This feeling of trust that enables musicians to take risks with the temporal structures takes time to develop and usually requires considerable personal practice so that one is able to come up with cross rhythms in performance and 'land' on the correct beat as one comes out. BB had been playing with the group for only a few months by the time of the recorded excerpt so he was just beginning to relax enough to be able to play polyrhythms and break up the time; he still felt that he didn't want to be 'getting away too much' (16.01.07) from the other musicians. While it is the case that polyrhythms may suggest a sense of distance within the time feel, the polyrhythm can become the principal auditory focus if other players join in with the illusory tactus. Another example of this lies in the performance of Slippers (see Chart 8 below) in which the drums quickly responds to the guitarist going into a dotted quarter note feel. Within one measure of the guitarist playing the dotted pattern, the drummer goes with this, joining in on beat 2 of the 50th measure, leaving only the bass player to continue with the walking bass line.

The guitarist talked about this joint playing of the model with reference to another tune in their set, 'Broadband' in which the guitarist plays the same temporal model which the drummer picks up on,

> 'I started it off, BB picked up on it, I just went with him, I suggested it, he started to play it and that's why I kept on with it because I felt like he went [*sings rhythm of the excerpt*] ...sometimes it's really nice, I mean I enjoy it just to lock in for a little bit' (12.01.07).

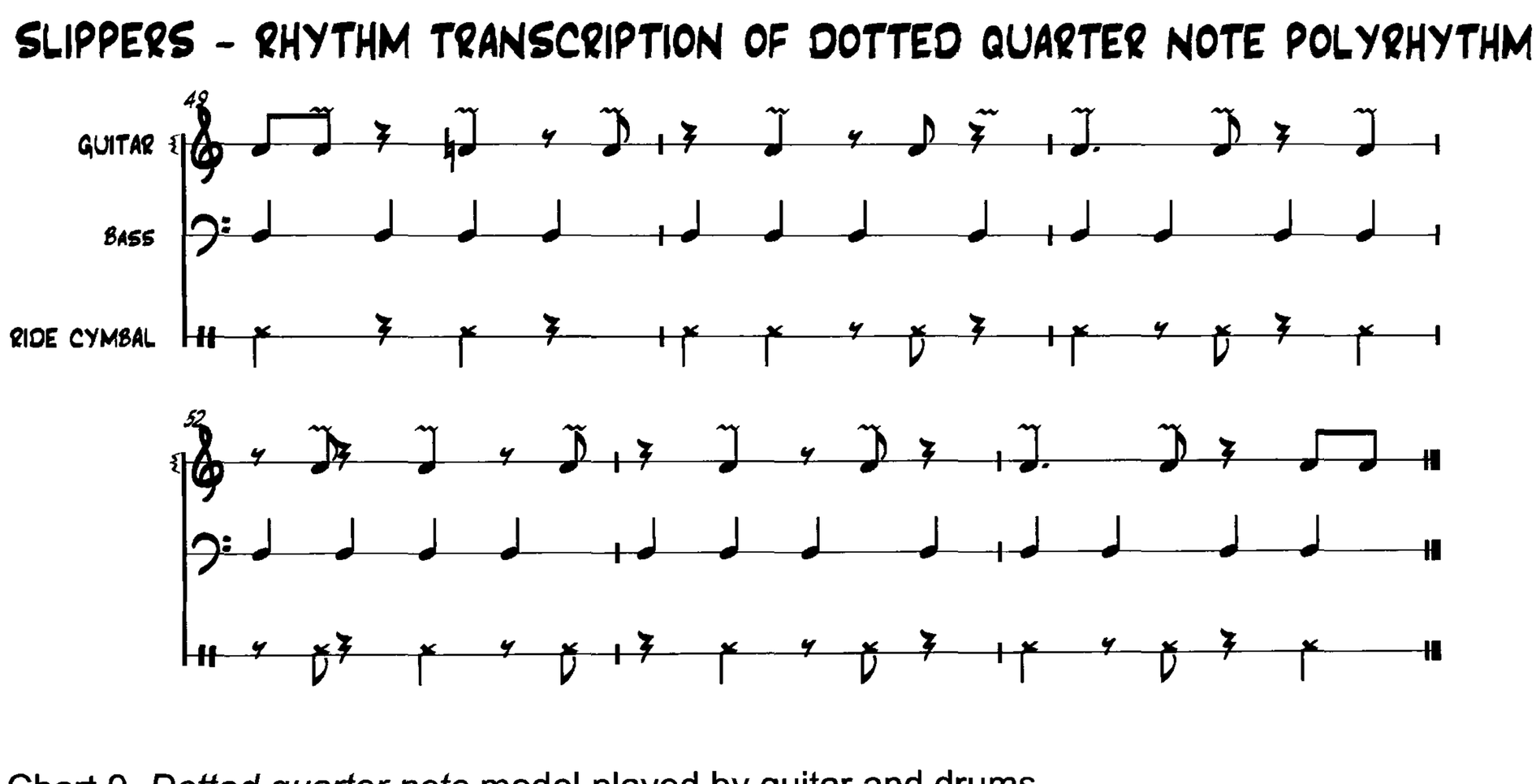


Chart 9. *Dotted quarter note* model played by guitar and drums.

The successful negotiation of these models between players promotes a musical intimacy but some of the players implied that being able to use these musically challenging models was something of a rite of passage. Firstly, through the amount of work that goes into becoming comfortable with these polyrhythms. BB, comparing these rhythmic figures to learning scales, commented

> 'I have just spent hours and hours learning them and practising them...it is about ten years ago now. You just have to practise them, it is part of what we do' (16.01.07).

Other players talked of these polyrhythms in terms of gauging their entry into more developed music scenes. SC and TS, pianist and drummer, both independently talked of the pleasure in working with more experienced players, having been less sure of their own playing of these complex rhythms,

> 'but when I started playing with them [*a group of more experienced players*] their phrasing in that kind of thing is so strong, it's like the mystery is taken away because you can hear where it's going; it's not like 'oh my god what is this? where is it going to come out?' – it's like…you know where it's going to come out, there's a phrase in there' (SC, 12.04.07).

TS spoke in not dissimilar terms about this,

> 'when you're surrounded by really good musicians who know it's all happening and have the language and who can also transmit that physically onto their instrument…that is incredible and I have to say that PD [*bass player*] really can do that and did do that – and it was a real eye-opener for me…it was like freedom basically, it was like someone else was right there in the same place as me, helping me, not waiting for me to round it up, or waiting for me to give the direction in a really obvious way, they're picking up on how I'm actually putting phrases together' (12.04.07).

In both these last comments, I sensed that these still relatively young and highly talented musicians were aware of these models not just as rhythms but as what such models said about them as players. As they began to play with more experienced musicians, they realised that the capacity to work with polyrhythms and complex time signatures also gave them entry into a higher league. Both players' comments seemed to imply that they were outgrowing their peers on the college music scene.

7.1.3 Overt models below beat level

My analysis of temporal models within this study has been primarily concerned with models at the beat level or above. The reason for this is partly methodological; the quarter note beat gave me a stable point of reference to work with and one which all members of each trio used substantially. However, within jazz performance, there are models at work which lie below the level of the beat.

The *swung vs. straight* model played at the level of the eighth note subdivision is central to the sound of jazz and though not the focus of this study, needs to be included in this taxonomy.

The term swing (and hence 'swung') is used in no single sense within jazz. It is often used in synonomously with groove to indicate a positive feeling in the music. As a model of subdivision however, it is used to denote the long-short division of eighth notes when the first of the pair of eighth notes is lengthened to approximately the first two beats of a triplet and the second note of the pair is shortened to the final beat of a triplet. As notation, the distinction can be made in the following chart showing how the swung eighth is usually felt as being derived from a triplet.

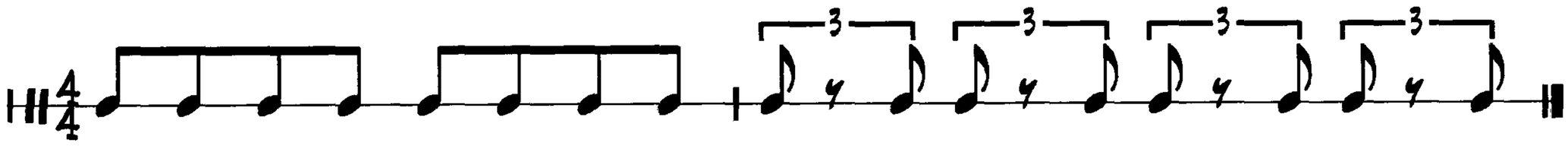


Chart 10. Notation showing the distinction between straight and swung eighth notes.

I have characterised this model as 'swung vs. straight' because this rhythmic feel exists on a continuum; at each end, the distinctive sound of these forms of the subdivision shown in Chart 10 is clear, but in the middle of the spectrum, the difference may be quite blurred. Within most jazz performance and within the

context of these excerpts, the degree of eighth note swing is dependent on no single factor. Largely, it is the tempo of the music that will determine the extent to which the eighth note subdivision is even or not (Friberg & Sundstrom, 2002). However, tempo is not the sole determinant. Other factors are whether the eighth notes are being played by rhythm section or soloist (as a very general rule, the degree of swing in the playing is less pronounced in a soloist's line), whether a more bluesy feel is being communicated in the playing (a more traditional blues based piece is more likely to have a stronger swung feel) and finally whether the playing is referencing an earlier era in jazz. These are very general rules of thumb but nevertheless can be heard with some consistency on jazz recordings. In addition to these stylistic influences on the model, there are of course individual differences between how musicians phrase the swung eighth note.

While the swing feel of jazz (the uneven playing of pairs of eighths) is seen as central to the playing of the music, the use of swung eighths as indicated in the previous paragraph is much more subtle, and in fact, too overt use of a swung feel is often an indication of very inexperienced playing. In the context of this study, the relationship between the use of straight and swung eighths can be seen to mirror that of quarter notes and the superimposition of dotted quarter notes. Where a swung or even feel predominates, then the use of the other can be used to imply tension or a sense of distance between players.

7.2 Covert models - metre and hypermetre

The final group of models, covert models, include the range of metric and hypermetric structures that musicians use when improvising. These stand at some

distance from the other models in these performances but still play some part in the shaping of the groove. By metrical and structural models, I refer to time signatures, song forms such as AABA or a 12 bar blues and so on.

In section 3.3.1, I outlined the argument that the perception of metre is accomplished through the entrainment of our attentional processes to underlying regularities in musical sounds. In that perceptual sense, our attunement to metre is an unmediated, primary experience, but metre is not just perceived but also known. London has summarised ways in which music theorists, usually in the form of notation, have attempted to make metre visible (2004); for jazz musicians, the metrical structure may be visible as part of a chart on a music stand but typically, and in each of these performances, the musicians are not using any form of notation. The metre however is usually well set up by the bandleader, counting the band in at the beginning of a number, and less visibly, the metre is set up apperceptively in the way that the musicians bring years of experience to bear as they prepare for the beginning of a number. Count-ins can be seen on the accompanying DVD for 'Slippers' and 'There is no greater love' and in both cases, the musicians (where visible) attend carefully to the count-in to orient themselves with the tempo and metre. In a number such as 'There is no greater love', and indeed for most jazz standards, the shared understanding is that the tune will be in 4/4; problems do arise in count-ins however when bandleaders count tunes off at very fast tempi when the band is expecting a medium tempo. Strictly speaking this may not be a metrical difficulty, but in practice, the band is preparing to engage with a particular tactus and if that expectation is thwarted, then it can take time for the time of the number to settle; in this case, the musicians may initially not be working from the same model. In one performance during this study, the musicians became metrically dislocated on a number; the soloist, SC, came unstuck with the

rhythm section and for one chorus played one beat out from the other two players; at those sorts of moments, what is usually an unmediated engagement with the metre becomes highly mediated as the musicians seek to recover joint attention. The musicians may articulate verbally where the first beat of the bar is or this may be articulated bodily or communicated very obviously by the harmonic, rhythmic playing of one of the musicians, in the attempt to get the other player 'back on board'. Monson describes a similar situation in which pianist Jaki Byard,

> 'snaps his fingers at the beginning of what should have been chorus 4 [and] we hear that is maintaining the original chorus structure in his mind and is aware that there is a discrepancy between his time keeping and Tucker's [*the bassist]'* (1996, 157).

The shared understanding of the metrical form can often go awry; on listening back to 'Evidence', ST commented that 'there might be a point where we got a crotchet out but I am not sure' (02.07.08) and a similar brief disruption occurred in one of the two performances of 'Slippers'. The issue for jazz musicians is not so much the making of occasional metrical mistakes, this is accepted as part of playing, but one's attitude to such mistakes. In describing his playing with another trio that he had formed recently, SC talked about the importance of acceptance and support from his fellow musicians and the implication (although he did not use the word 'groove') was that groove became so much more possible under those conditions. He described the other players' attitudes on gigs and how that helped to communicate with audiences,

> 'but even if a beat goes missing or I go to the bridge too early…there is no "that was wrong"…it is an energy thing [and] I think we all have that in common…people [*referring to audiences]* respond to that more than correctness' (30.06.08).

Although a shared sense of the metre is a pre-condition for groove, the above suggests that perhaps more important is the attitude of the musicians on occasions when the metre becomes unlocked between players. A positive attitude also sets up the conditions for groove as a mutually supportive group of players is more likely to allow a feeling of groove on the bandstand than a judgmental group. AS pointed out that in his experience,

'when fear comes into the mix, there is no groove…the slightest amount of being unconfident or not confident with something, you lose the groove' (07.07.08).

When musicians are familiar with the metrical and song structures over which they are playing, then they are going to play with more confidence through knowing their place in the song structure and the groove as a feeling of mutual tuning-in is more likely to occur.

An extreme example of getting comfortable with a metric model was BB's playing a drum solo in 15/8 in the recording of the DC Group's London gig. The fact of playing in a less familiar time signature had an impact on his playing the solo; it took a number of performances before he began to be able to play with freedom. The point at which he became comfortable with the solo came when he got beyond counting the beats of the metric model and began singing the riff in 15/8 over which he played the solo – a good example of getting the musical knowledge to the point where it becomes felt. BB explained,

'[15/8] was really challenging, I mean I did have to practise it…but I didn't practise the solo, what I did, was just really, really try and learn the riff so it's that thing of not counting 15, you can't play a solo while you are counting 15' (16.01.07).

The same sorts of issues exist in relation to hypermetric structures but the effect of losing one's place in the song form is perhaps less dramatic on the sense of groove than a problem with metre. Nevertheless, most musicians would concur that being unfamiliar with a song structure (there are a significant number of standards, for example, that do not follow conventional 8 measure segments in the song form) does not help in allowing the groove to emerge. The relationship between groove and these sorts of underlying structures is explored in more depth in the following chapter.

7.3 Taxonomy of temporal models

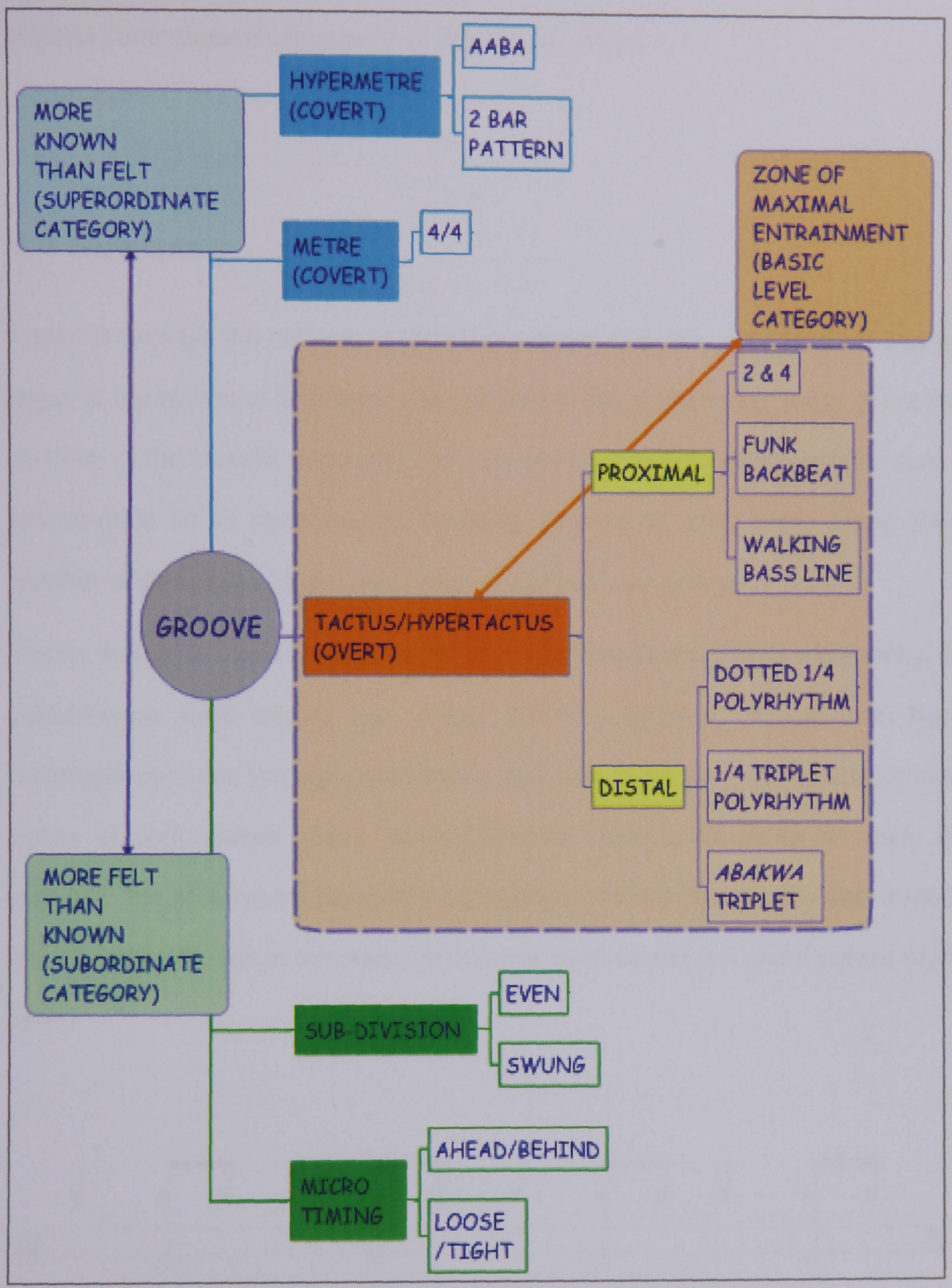


Figure 3. Taxonomy of temporal models used within these performances.

In Figure 3 above is a taxonomy of the models used by the musicians in these performances. The layout of the models is explained in 7.4 before I go on to discuss some theoretical aspects of this classification.

7.4 Summary

Figure 3 displays the network of temporal models that musicians perform and talk about in the course of their work and presents these in ascending order of the time duration of the models, beginning with microtiming durations of the order of tens of milliseconds up to hyper-metres involving sections of song form. There are a number of elements to this classification that need highlighting.

Firstly, that while these models are laid out in a form that suggests a hierarchy, the performance data shows that these different temporal models are highly interdependent and through combination can yield other temporal models; in most cases of performance, these levels of model have to be jointly at work. For instance, the prototypical jazz pattern played on the drumkit incorporates a model dyad - that of the *ten to ten* model on the ride cymbal with a *2 and 4* played on the hihat.

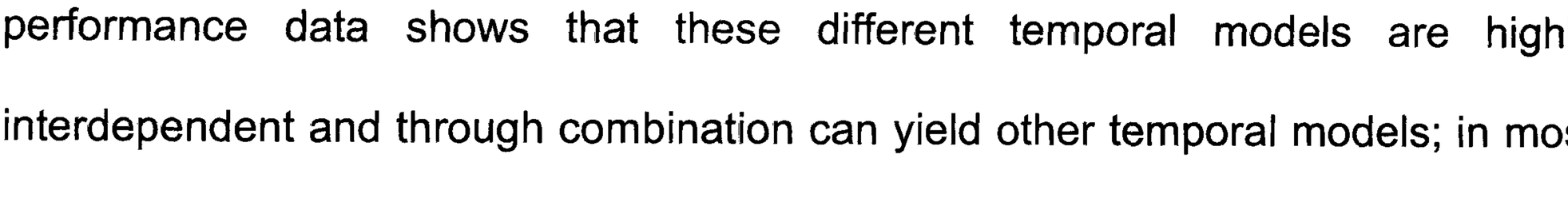


Chart 11. Idealised combinatory drum model.

The above example shows a very simple amalgam of two models that go to make up an idealised drum pattern; above and below these two models are of course

metric and subdivision models that frame and inflect the playing. Furthermore, while most of these temporal models are intentionally deployed in the course of improvising and grooving – these range from the *hypertactus* level down to the *subdivision* level – at the extreme ends of the hierarchy are models that exist only as part of musical form or metre (metric and hypermetric levels) and at the other extreme exist as part of the 'feel' of the music, that is at the *microtiming* level; in this sense, they are not deployed as rhythmic figures but form part of the temporal ground.

The other classification that I have made use of in this chapter and continue with in the next is the distinction between 'proximal' and 'distal' models that the musicians employ. These are a subset of the 'overt' temporal models that musicians use. As I have shown in this chapter, both forms of model at a syntactic level can serve to tighten or loosen the groove structure. An important point is that I have characterised particular models in this chapter as 'distal' or 'proximal' but of course as shown in the diagram, 'distal' models might well serve as 'proximal' models and vice versa, dependent on the underlying metrical framework (whether for instance the tactus is a quarter note or dotted quarter note and so on). It is only in a temporal *relationship* with other models that the sense of widening or narrowing the temporal focus occurs.

The particular models shown in Figure 3 play different roles in their capacity to entrain. Put another way, certain models could be said to have different degrees of effect or power on our cognitive apparatus. The middle two sets of models are described as *tactus* and *hypertactus*. I have noted in the diagram that these constitute the 'zone of maximal entrainment'. Research has shown that particular periodicities seem to 'capture' our sensori-motor apparatus. Musical entrainment seems to be most apparent at around 5-600 ms and the entraining tactus is

typically felt as the quarter note (dotted quarter in a 12/8 metre) or the half note (which could be the 2 and 4 on a fast jazz number). In playing slow jazz ballads at 50 bpm or less, drummers and bass players may often mentally supply the tactus in the form of an eighth note even though they may only be playing quarter notes. In the performances, it is possible that the relatively close synchrony between the players in the SC Trio is a consequence of the tempo set at around 120 bpm, which puts the quarter note pulse within the region of maximal pulse salience (Parncutt, 1987). Models at either end of the temporal scale appear to be of less consequence in entrainment although the microtiming model at the foot of the hierarchy is crucial for any *descriptions* of an entrained phase relationship between players.

In Chapter 4, I briefly introduced the idea of the basic level category as having relevance for the way that we model the world. Here I want to explore this idea more closely in the light of the taxonomy that I have set out above.

7.4.1 The tactus as a basic level category

The concept of the basic-level category radically altered the accepted view on our modelling the world from being a rather arbitrary process to one of ecological significance. Categories of objects in the world were recognised by Rosch as having quite different levels of availability and informativity and she proposed that they came into being not in an arbitrary way but through the interaction of cognition and the environment (Rosch, 1978; Rosch et al., 1976; Varela et al., 1991).

As touched on earlier, the basic level of category is defined as that level in a taxonomy at which 'biology, culture, and cognitive needs for infomativeness and

economy [are] all met' (Varela et al, 1991, 177). The typically cited example of a basic level category is that of the chair. *Chairs* as concepts lie in the middle of taxonomies of *furniture* (the top level) while below them are specific forms of *chair* such as *dining chairs* or *armchairs.* In this example, *chairs* but not *furniture* or *dining chairs* have most cognitive salience. The basic level of *chair* enjoys that salient position not through any historical decision about chairs but because this level of categorisation has an embodied psychological reality for us. In this respect, we can see a similarity between taxonomies of furniture and of the temporal models listed above. In the middle of the hierarchy is the most cognitively useful model, that of the tactus. It derives its position not for any music theoretic reason but because it enjoys a particular embodied resonance for making music. At this level, we are most likely to entrain to a beat and it is to this level that we will most likely spontaneously clap, and it is at this level that I would suggest the power of groove is being felt. Prior understandings of the basic level of category have focused on its conceptual salience but the suggestion here is that the basic level not only has categorical, conceptual power but is also a fully embodied felt quality.

This felt categorisation can be seen in the way the models in this groove taxonomy are known or felt differently depending on their level in the hierarchy. The greater the superordinacy of each model's position in the hierarchy, it is successively less *felt* as part of the process of playing and more *known* as part of musical knowledge. For example, the *hypermetric* level which includes song forms such as AABA has structural importance, is categorically distinct (from say, a 12 bar blues or AB song form) and even at the fastest tempi is of too great a duration to be held in short term memory as a whole experience. As is the case with a song form such as AABA, such models are readily accessible as parts of musical discourse.

At the more subordinate level, for instance, the *swung vs straight* model, the categorical distinction between these two representations of the eighth note subdivision are considerably more fuzzy. While notions of swung and straight are discursively available as models, such models are more resistant to words and classification. They are *felt* as process rather than known as structure. Zbikowski (Zbikowski, 2004) has correctly seen these different models as different forms of knowledge, embodied and discursive, which all contribute to his conceptual model of groove whose outline was looked at in 4.4.

While I suggested in the previous chapter that the inability of musicians to talk about their experience of being in time together is symptomatic of temporal intersubjectivity being resistant to words, it is important to clarify that this does not mean that such experience is beyond conceptual knowledge or beyond existing as some sort of discursive model. While musicians may not always be accurate in their assessment of these liminal states of timing, they **do** put labels on these states and can talk about being ahead or behind, rushing or dragging in a similar way to their talking of AABA or a quarter note notated on a page.

Although the setting up of my distinction between a primary intersubjectivity through entrainment and a secondary intersubjectivity through shared cultural knowledge still stands, it is also important to recognise that these are not exclusive states. The foundational primary intersubjectivity itself – the unmediated experience of being in time together – becomes modelled through repeated bodily and affective experience. In the same way that Lakoff and Johnson's bodily image schemata are generally regarded as lying beyond conscious awareness, we nevertheless are able to conceptualise these schemata and understand them as discursive concepts; through repeated experience, pre-conscious models can

move into greater levels of awareness and so it is with the primary experience of being in time as a musician.

7.4.2 Proximity, distance and illocutionary force

I want to finish this chapter by returning to the idea of pragmatic approaches to meaning, discussed in Chapter 2, and suggest how these models, taxonomised musically in terms of overt/covert, proximal and distal, can be further theorised in terms of their explicit/implicit meanings which are interpreted here as locutionary and illocutionary force, ideas borrowed from Austin's work on pragmatics.

In parts of this study, musicians talk in terms of loose and tight, tension and release as aspects of the feeling of groove. Temporal models seem to have a role in setting up musical proximity and distance at a number of levels. I have described how these dimensions exist at the hyper-tactus level as musicians introduce polyrhythms, in the use of straight or swung off beat eighth notes and at the lowest level of timing as a felt closeness or separation. But in the way some musicians talked of these models, it was clear that their usage had social consequences, distinct from their musical effect.

Austin distinguished between locutionary, illocutionary, and perlocutionary force in language use (Thomas, 1995). Locution can be defined as the actual words uttered, illocution as the meaning 'behind' the words and perlocution as the effect of the illocution on the hearer. Making use of these features, one could say that the *locutionary* force of using combinations of models is to generate musical feelings of tension/release, distance and proximity, which musicians understand as part of the musical fabric. However, pragmatics recognises that meaning exists largely through the implications of social context rather than literal reference. For

instance, polyrhythms whose locutionary work is to set up a metrical (literal) distance, as shown in the comments of SC and TS in 7.1.2, had considerable *illocutionary force* that implied a set of very different meanings for the players, not available in the musical surface. For SC and TS, the illocutionary use of such models was in fact a means of signalling their feeling *close* to the more experienced players with whom they were beginning to work. By being able to play these challenging rhythmic phrases, they were in effect showing their belonging to the group, and their use can be seen as a means of changing or maintaining social relationships.

In this sense, the models that are described in this chapter can be seen as having a complex, dual role. Firstly they allow for musical, locutionary expression but their *illocutionary force* is permeated with social meaning. A second example illustrates the *perlocutionary effect* of a model. I go back to DC's description of audiences clapping on the wrong beats in a performance. There is no metrical or locutionary problem in an audience clapping on beats 1 and 3 and the illocutionary meaning of the audience clapping is in fact their suggesting *belonging* – but the perlocutionary effect on the musicians is one of isolation and speaks of the sense of separation that can occur when audiences' and musicians' use of models do not correspond.

It has not been the intention here to develop a full theory of musical pragmatics but these examples do suggest that the relationship between explicit and implicit meanings of temporal models is a powerful one and worth investigating in future studies.

In Chapters 6 and 7, I have examined the two sides of the intersubjective fabric of groove. Firstly, looking at basic timing processes and the entrained behaviour of musicians, and secondly examining the forms of shared cultural knowledge, here presented as temporal models. In the final data chapter, I look at how entrainment

and models interpenetrate in the setting up of groove and its meanings for musicians.

8 Three trios - groove

The study so far has examined two forms of musical intersubjectivity – the entrained timing of players and the shared cultural models that they put to work as they play together.

In Chapter 6, I explored the entrained behaviours of the players. To play in time, musicians must first look to themselves and work on developing awareness of good timing practice. In performance however, timing between players is not simply about sensori-motor skills but about applying those skills within a musical role. For the players in this study, part of their identity within this musical culture is bound to their being soloists or rhythm section players. Findings emerged from the analyses that showed how the entrained behaviours of the musicians were modulated by role and relationship with others. In analysing the timing of individuals, timing relations between the players and finally tempo, a solid picture was gained of the temporal preconditions for groove and players' thoughts on musical time.

In Chapter 7, musical intersubjectivity was further explored through the shared temporal models that musicians routinely use in performance. Using the theoretical conception that culture is 'whatever it is one has to know or believe in order to operate in a manner acceptable to its members' (D'Andrade, 1995, xiii), I developed a taxonomy of the temporal models that musicians draw upon in the course of playing with one another. Here was a set of temporal models that framed

the basic entrained behaviours of the players and organised their temporal experience.

In this final chapter of analysis, I argue for an understanding of groove that requires both these elements of sharedness but cannot be reduced to either. In the course of this chapter, I also propose that groove cannot be measured in the way that Michael Stewart's groovagram suggests (Fig.2, p142); timing can be measured and we can make inferences from timing about grooves but groove is also phenomenal experience, the feeling of the timing relations for the players, in other words the *feeling of entrainment.*

The first part of the chapter is devoted to the groove of each group. In particular, I examine how micro-timing and the temporal models that structure grooves are interpenetrated. This analysis of the sounds of performance is then supplemented by an examination of the musicians' moving with the sounds they make, the visual aspect of groove. These findings are then framed by the verbal reports of the musicians and I present the ways in which the musicians in this study make sense of groove and how they feel it. The chapter ends with a discussion of the cognitive foundations for meaning in groove.

8.1 Three performances, three grooves

Groove as a group dynamic

Timing may be the property of an individual but groove results from timing relationships emerging from the entrainment between players. This began to be developed in 6.3, in which the timing relations between different pairs of players

were examined and it was clear from 6.4 and 6.5 that the rhythm section's work is more identified with the aesthetics of groove than the soloist. The argument has been made both in the literature and in jazz musicians' vernacular that groove is a property of the rhythm section, a ground over which the soloist plays figures, and the timing profiles of the rhythm sections and the soloist/rhythm section in this study strongly suggested that role and microtiming are correlated. However, too marked a separation of soloist and rhythm section suggests that the experience of groove can be compartmentalised. This is unconvincing on two counts. First, in contemporary jazz, the level of interaction between players rather negates the idea of a stark contrast between figure and ground; the soloist remains the leading voice but the relationship between rhythm section and soloist in contemporary playing is much more subtle than the figure/ground model suggests. Second, as phenomenal experience, the sounds of a grooving band are experienced as a whole. While the bass and drums may well be the centre of attention in groove production, we cannot choose to take the soloist out of this whole sound experience; a groove *is the emergent property of the group.*

In the extracts that follow, I now bring together both primary and secondary aspects of the musical intersubjectivity that I have proposed as foundational to groove. I look at the ways in which the groove emerges from both the entrained timings and cultural models of the players.

Mean relative asynchrony – analysing group timing relations

In looking at the timing relations between each group as a whole, I have made use of an analytical method based on the work of Rasch (2000). In following Rasch's method, the absolute timings were taken for all on-beat quarter notes on which all musicians simultaneously played; from these absolute times, a mean value was

derived for each of the shared onsets and each player's asynchrony relative to this mean could be calculated. Clearly, this mean value does not represent the 'beat' but it does provide a means of establishing a notional centre against which the relative positions of players can be judged; in this way, the very fabric of the group's time can be examined.

8.2 Analysis of three grooves

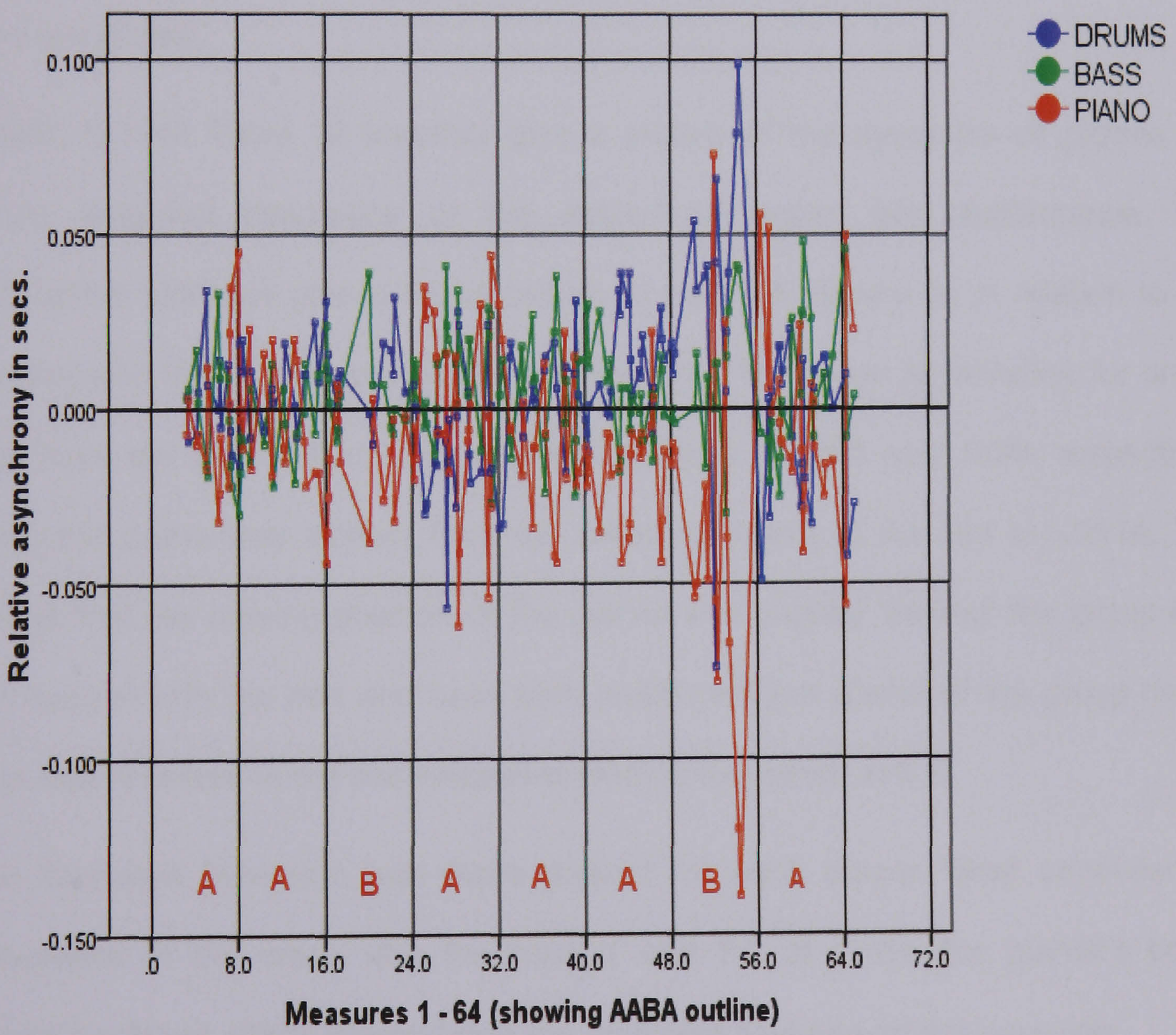
I have argued that an examination of groove needs to take account of the interpenetration between the entrainment of the players and the temporal models that frame this collective 'being in time together' – the process and structures of jazz temporality. I examine this dynamic and assess to what degree different forms of temporal model affect the collective timing. I have chosen two exemplary model types from the taxonomy laid out in the last chapter. Firstly, those models that could be said to be part of the musical surface, such as *2 and 4, dotted quarter note* and *quarter note triplets.* Each of these is used intentionally (though not always consciously) by the players, can be introduced at will into the musical surface and may be withdrawn. I referred to these in the taxonomy as *overt* models. The second type of temporal model are entirely structural – the metric and hypermetric structures of the pieces. I have described these forms of model as *covert.* My analysis explores to what degree such different forms of model penetrate the overall entrainment between the players.

For most of the following analyses, I established two baseline measurements in looking at areas of interest. This was to enable me to look at those points where the groove appeared to change significantly towards being looser or tighter

between the players. I defined loose areas as those where the range between players was greater than 60 ms over three consecutive onsets. Tight areas were defined as those with a range between players of less than 40 ms over three consecutive onsets.

SC Trio – 'There is no greater love'

The groove in this piece had a strong *2 and 4* feel to it particularly at the beginning and the bassist laid down a strong *walking bass* line throughout the extract.



Graph 12. SC Trio – 'There is no greater love' – groove plot.

	N	Minimum	Maximum	Mean asynchrony	Std. Deviation
DRUMS	153	-.074	.099	.006	.023
BASS	153	-.030	.048	.005	.016
PIANO	153	-.139	.073	-.011	.029

Table 12. SC Trio – relative asynchrony of players from group mean in seconds.

In Graph 12 each performer's distance from the zero abscissa (which would correspond to synchrony) gives an indication of their relative position in time to the group. Onsets depicted below zero are behind the group mean and onsets above zero are ahead.

Graph 12 and Table 12 together give a picture of the dynamics of groove and group temporal interaction at the micro-level within this performance. The descriptive statistics give a broad picture of how the players lie in relation to one another and the relative breadth of their playing. The mean asynchrony for drums and bass are both within 1.5 ms of one another at .006 and .004s respectively while the piano was distinct from the other members of the trio at -.011s. This shows that the playing position of the pianist was slightly 'behind' the group over the excerpt with the ride and bass both positioned just ahead of the group mean. This was reflected in the soloist/bassist timings examined in 6.5.

The Standard Deviation was more distinct for each player. Most consistent in adherence to the mean was the bassist with SD of .016s; the pianist's timing showed a SD of .029s, almost twice the standard deviation of the bass line.

The mean asynchrony of the players suggests that overall, this was the tightest of the three performances and yet there was considerable movement in each instrumental part. The groove remained consistent through most of the two

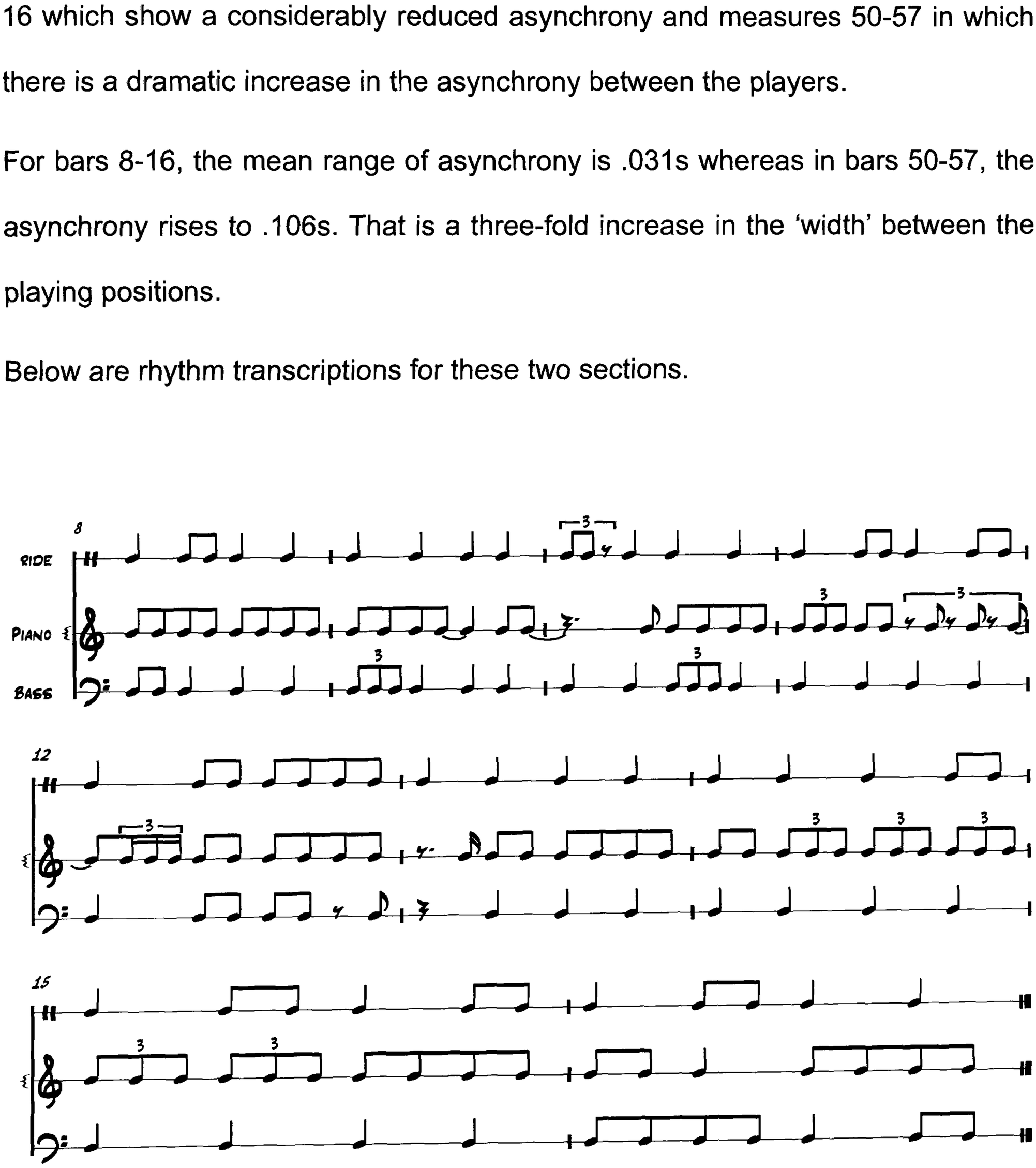
choruses until the 'B' section of the second chorus when it changed significantly. This significant change in the groove is examined in the next section.

Overt models

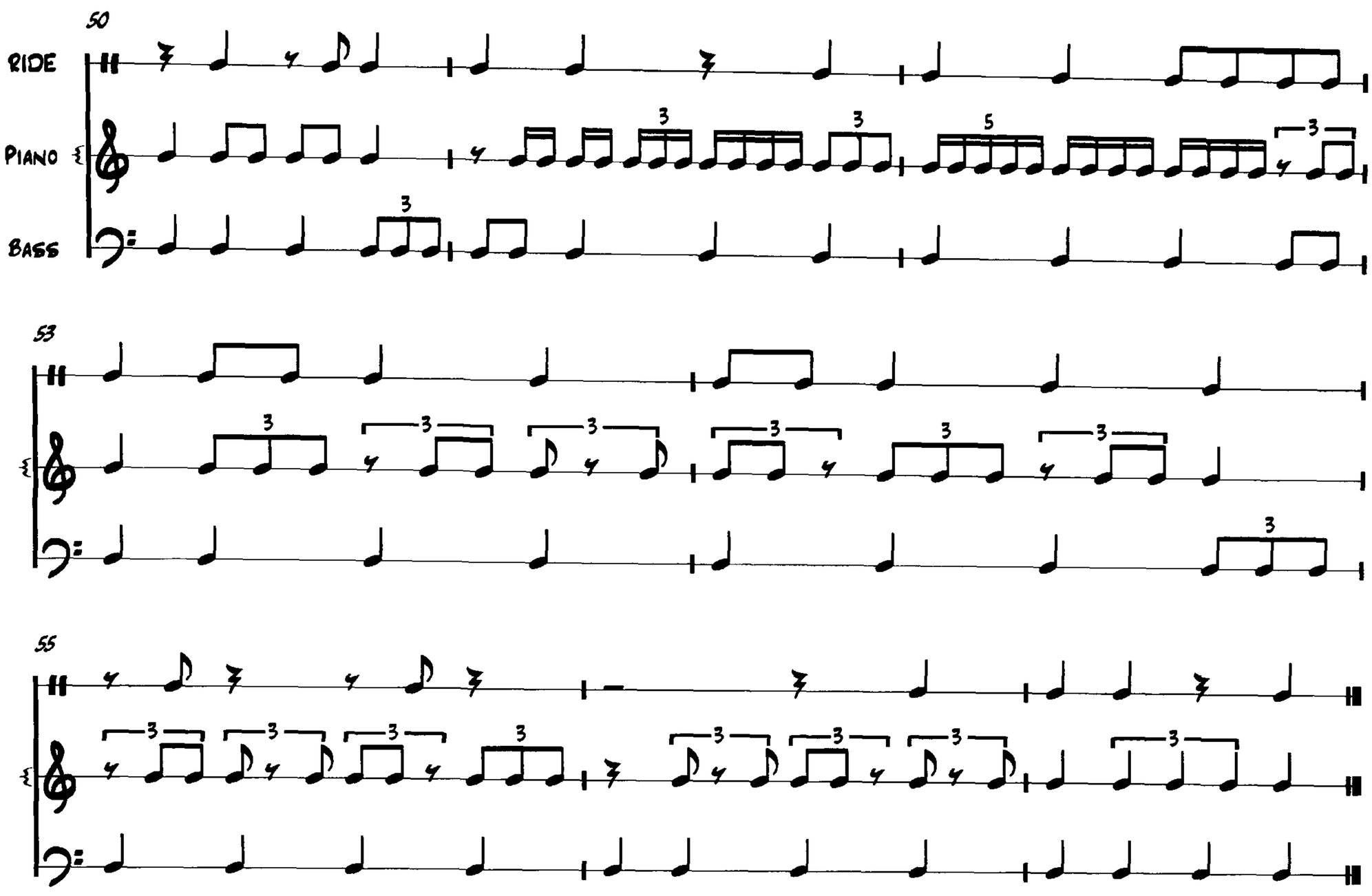
Graph 12 illustrates the momentary changes in the group dynamics through the piano solo. Most striking are two areas of contrast in the group time, measures 8–16 which show a considerably reduced asynchrony and measures 50-57 in which there is a dramatic increase in the asynchrony between the players.

For bars 8-16, the mean range of asynchrony is .031s whereas in bars 50-57, the asynchrony rises to .106s. That is a three-fold increase in the 'width' between the playing positions.

Below are rhythm transcriptions for these two sections.



Measures 8-16



Measures 50-57.

Chart 12. SC Trio – rhythm transcription (measures 8-16, 50-57).

In these 8 measure sections, there are contrasting features which utilise some of the temporal models described in the previous chapter. The rhythmic basis of the pianist's solo is a combination of swung eighth and triplet patterns (only eight bars in this 64 measure solo are dominated by sixteenth note patterning). This is not surprising given the tempo and 'retro' feel set up by the rhythm section during the head [27] and continuing throughout the solos.

In the first segment (measures 8-16), the eighth note is consistently swung by the pianist except for measure 9 in which the first 4 eighth notes are played evenly; the swung eighth notes then blend into a triplet phrase in measures 14 and 15 in which the *quarter note triplet* model is emphasised. The phrasing of the ride cymbal and the bass in this part of the solo is semi-broken, that is, moving away from the conventional ride cymbal and walking bass line but not breaking the

overall narrative feel of these conventional patterns; the drummer maintains a strong *2 and 4* on the hihat throughout, thus anchoring the rhythm through this section. The pulse is articulated on virtually every beat by the bassist – only the first beat of the 13th measure is not stated. The groove between the players shows a mean asynchrony of .013s.

In the second segment, measures 50 to 57, there is a very wide timing gap between the players with a mean asynchrony of .106 ms. The bassist and drummer play similar patterns to those in the first 8 measure segment with the exception of measures 55 and 56 in which the drummer responds to a variation of the *abakwa* model [28] employed by the pianist over four measures (measures 53-57). The drummer's response to this model is impressionistic and appears to almost deliberately 'subvert' the time feel at this point. It is the bassist who maintains the strong rhythmic line through this climactic part of the solo with a nearly unbroken walking bass line and whose timing remains closest to group synchrony, confirming that it is the pianist and drummer whose playing becomes less synchronous in this section.

The effect of the *abakwa* model is to superimpose a pulse that is 25% slower than the original. Whereas the original tactus beat is made up of three eighth note triplets, the superimposed 'pulse' is comprised of four such triplet beats (with the final beat *tacet)*. If all the musicians were to 'relocate' to this new pulse, taking it from the first beat of each four note grouping, then the overall tempo would appear to drop to about 90 bpm. What is compelling here is the association between the use of a model which sets up a distance between the original pulse and the new implied pulse, and the *correspondingly* greater distance between the players measured in milliseconds. While this timing distance may not be the product of any conscious behaviour, pianist SC, commented

> 'If you're implying this crochet triplet thing over the top and suddenly it has this whole other effect and feel and groove to it, if that slows up or speeds down a little bit, although you want it to be exact, it still has another groove to it' (12.04.07).

The pianist's point here is that although players want to play these polyrhythmic models accurately, the timing may well change in a subtle way and this makes a contribution to the groove and its feeling at that point. This suggests some intentional links between greater timing discrepancy and the models that suggest distance and separation at a syntactic level.

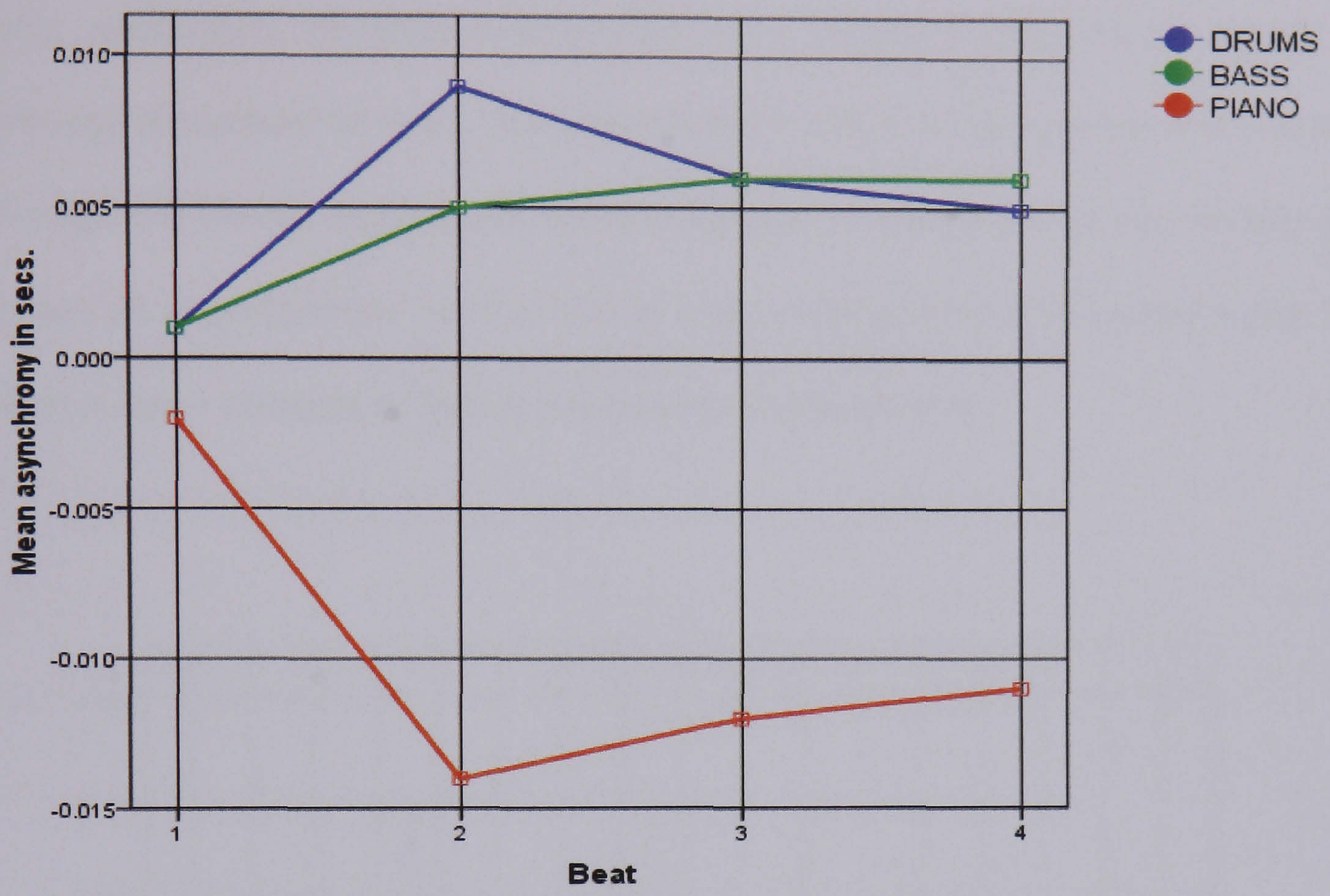
Overall, the trend of the groove in this solo is one of increasing fracture developing out of a much tighter opening to the piano solo. At the point where the pianist goes into this strongly polyrhythmic voice, the solo reaches its climax before winding down over the final eight measures.

Covert models

In the previous section, I made the case for changes in the groove occurring through the musicians deploying certain overt models with a resulting tightening or loosening of the coupling between them. I contrasted the timing between the early and late parts of the solo.

Other, less explicit, temporal models are also at work through the course of performance. Of interest here is the degree to which covert structures, the metric beats, may impact on the groove. Obviously the beats in each measure of the music are not deployed in the same way that a musician makes use of *2 and 4* or a *dotted quarter note* in the course of performance. However, metric models contribute to musicians' overall feeling for the structure of a piece. The extensive literature on classical pianist's expressive timing shows clear links between metric

and other structures in the shaping of expression (Clarke, 1995; Repp, 1990; Sloboda, 1983). How would the groove behave at particular points in the metre in these performances?

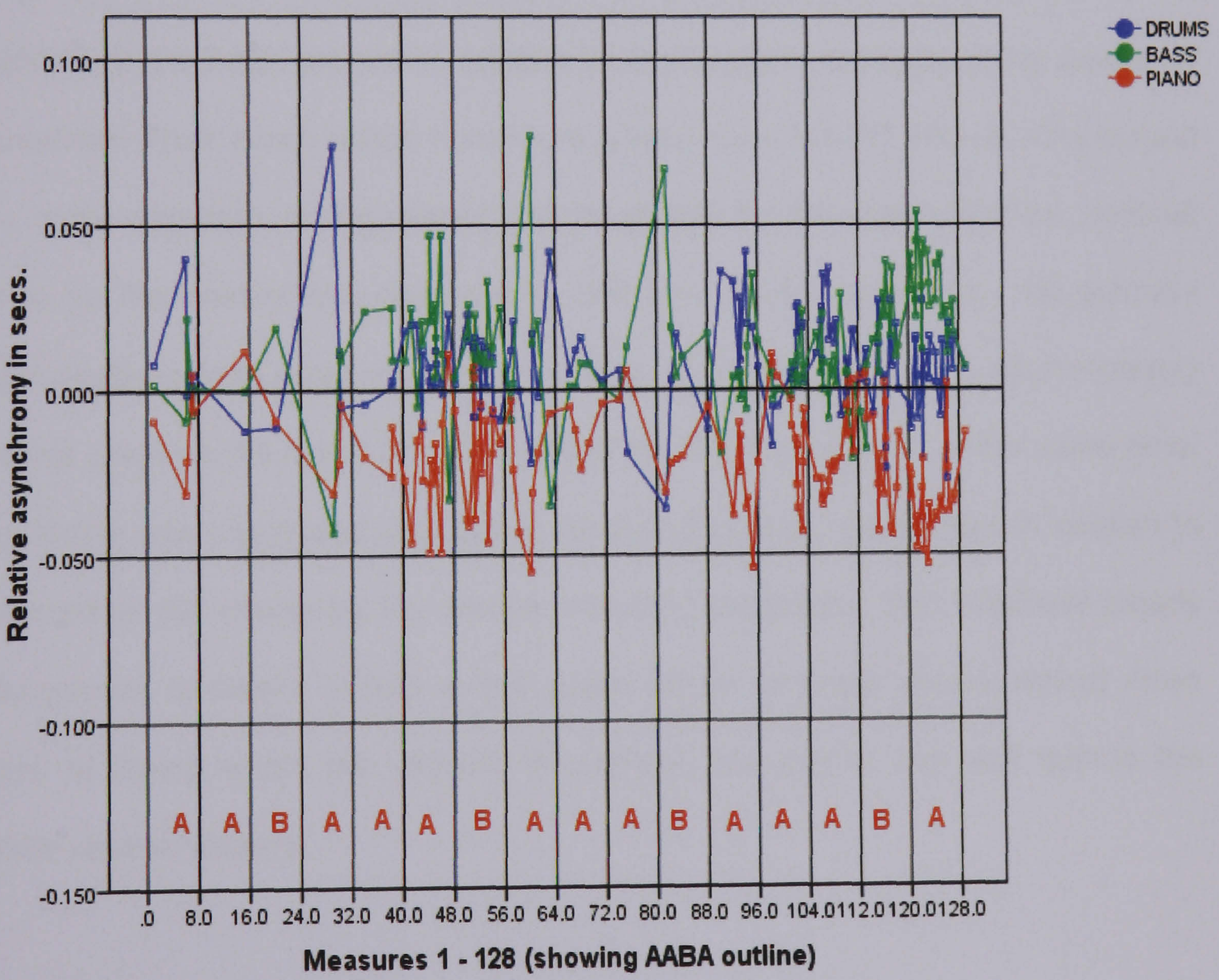


Graph 13. SC Trio – asynchrony as a function of beat.

Graph 13 shows the players' asynchrony on beats 1, 2, 3 and 4 through the whole extract. The graph confirms the way in which the two rhythm section players lie ahead of the soloist and on beats 1, 3 and 4 are highly synchronised together. Most strikingly, the graph shows a correspondence between beat in the bar and synchrony for the whole group. There is a marked increase in synchrony between all three players on the first beat of each measure in contrast to the other three beats which suggests a systematic but pre-conscious coming together for all players on beat 1.

JD Trio – 'Evidence'

The JD Trio's performance of 'Evidence' by Thelonious Monk displays a rather different group dynamic. The fast tempo of this piece (c 240 bpm) combined with a highly interactive, densely syncopated style between the players made this a challenging number to play. All three players felt that the performance went well although the pianist expressed some reservations about the sound on the gig and expressed a preference for the trio to have moved from the earlier more broken feel to a more consistent timing framework a little sooner.



Graph 14. JD Trio – 'Evidence' groove plot.

	N	Minimum from group mean	Maximum from group mean	Mean asynchrony	Std. Deviation
DRUMS	142	-.036	.074	.008	.015
BASS	142	-.043	.077	.013	.018
PIANO	142	-.055	.012	-.022	.016

Table 13. JD Trio – relative asynchrony of players from group mean in seconds.

Using the same method as applied to the SC Trio, the above graph and table offer a picture of the dynamics of the groove through this part of the piano solo.

In contrast to the SC Trio, a striking feature of the playing is the relatively steady positions of the three players in relation to one another throughout the course of this extract. Their mean asynchronies are greater than the SC Trio, ie, they played in a more separate configuration; this is shown by the distance from notional centre for the bassist and drummer is .008 and .013s respectively, the pianist's mean distance from group mean is -0.022 s. In each case, this is approximately twice as great as the mean asynchronies of the SC Trio players. At the same time, their timing was much less variable; in other words, they moved less in relation to one another (as shown by the smaller standard deviation). This relatively steady arrangement is clearly visible in the graph which at times shows almost three layers of timing within the groove; throughout, the pianist lies well behind the rhythm section players.

Overt models

Parts of the extract showed distinct regions where the groove grew tighter or looser. As mentioned earlier, I looked for regions in which 3 or more contiguous

time points were either < 40 ms or > 60 ms as respectively showing tighter or looser playing. The groove became tighter at measures 97-106 and 110-114. The most noticeable loosening of the groove came in measures 115-125 towards the very end of the solo. Below I include the notation for measures 97-106 and 115 - 125 as examples of both extremes of the groove-time.

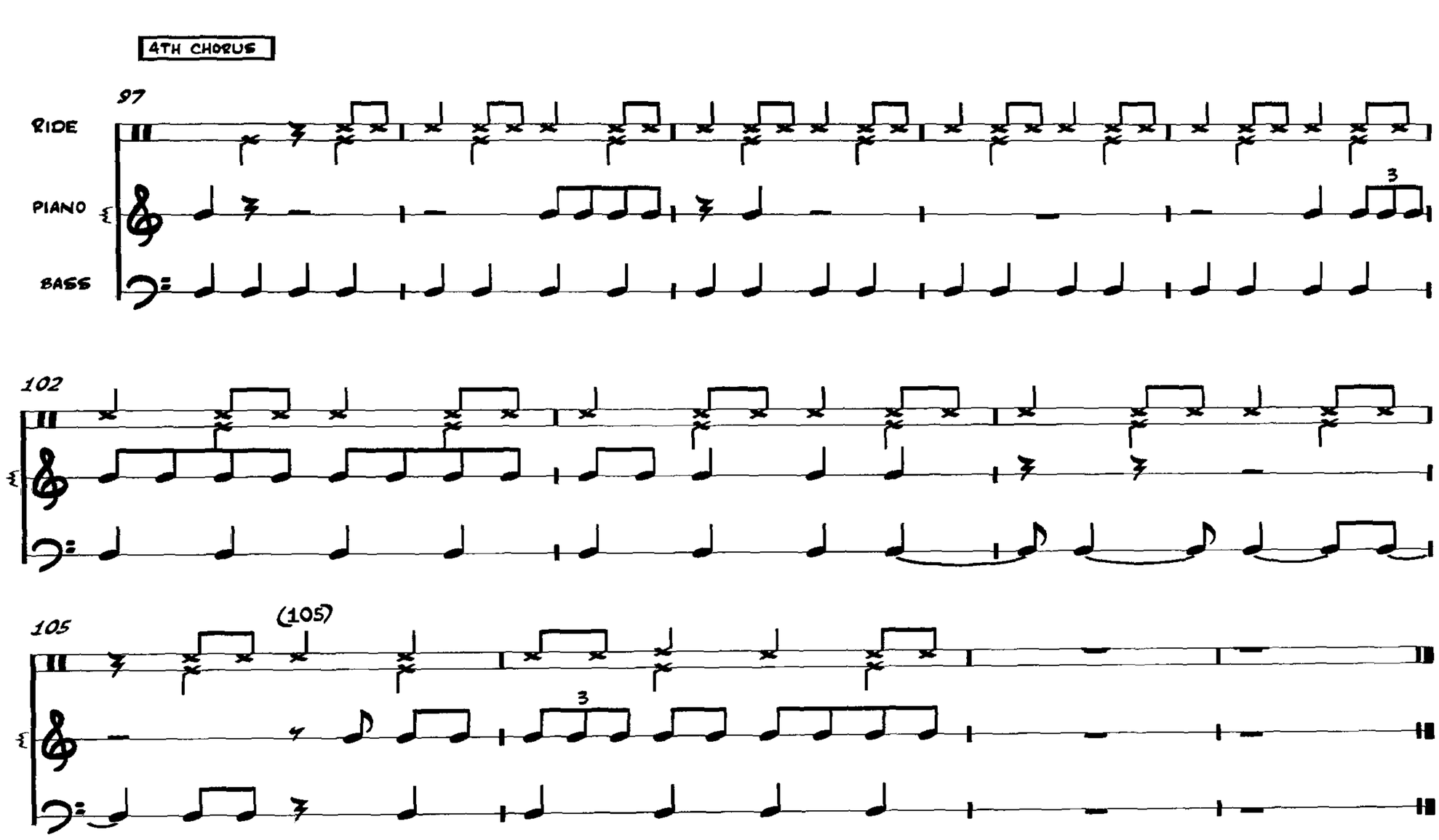


Chart 13. JD Trio – rhythm transcription (measures 97-108).

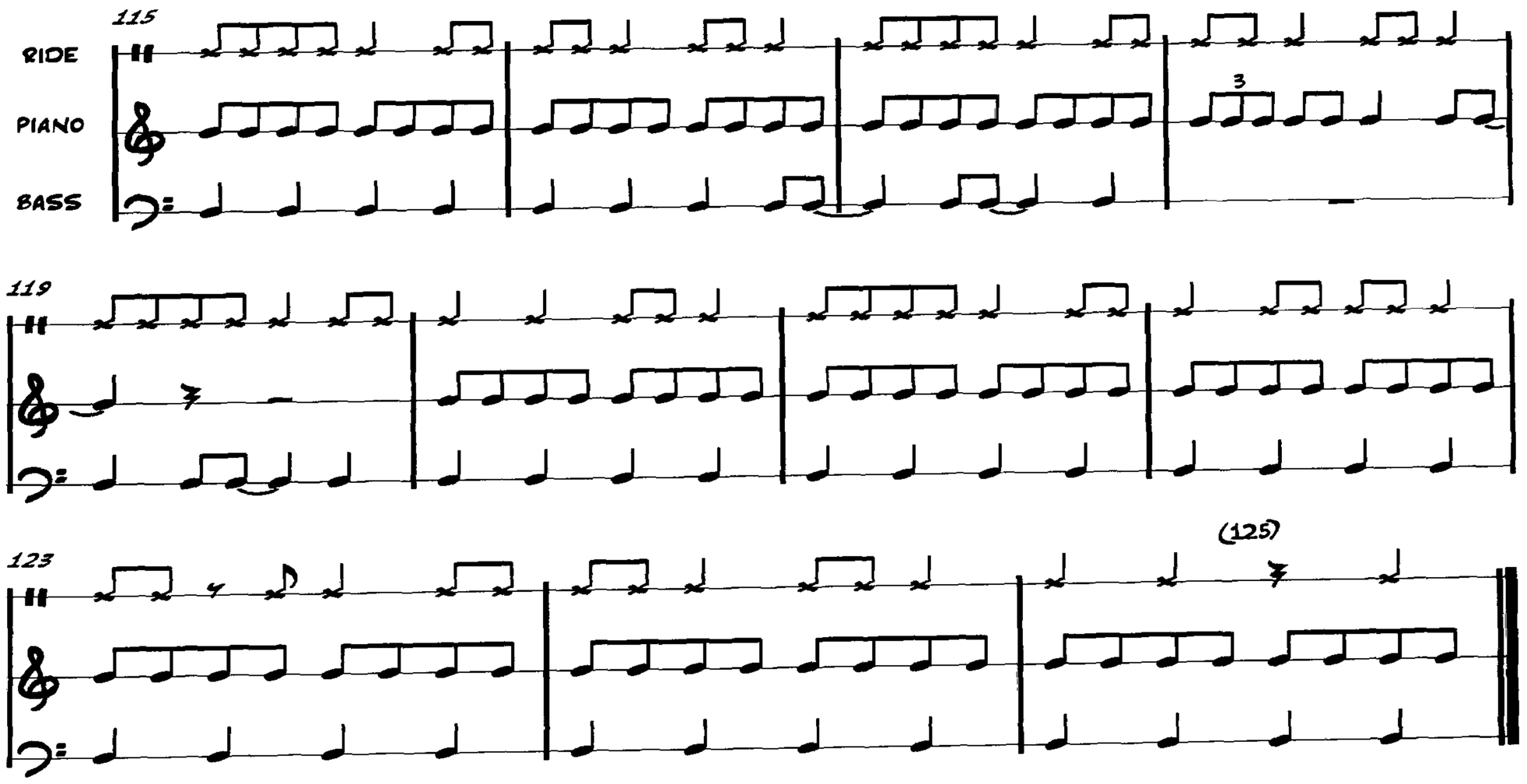


Chart 14. JD Trio – rhythm transcription (measures 115 – 125).

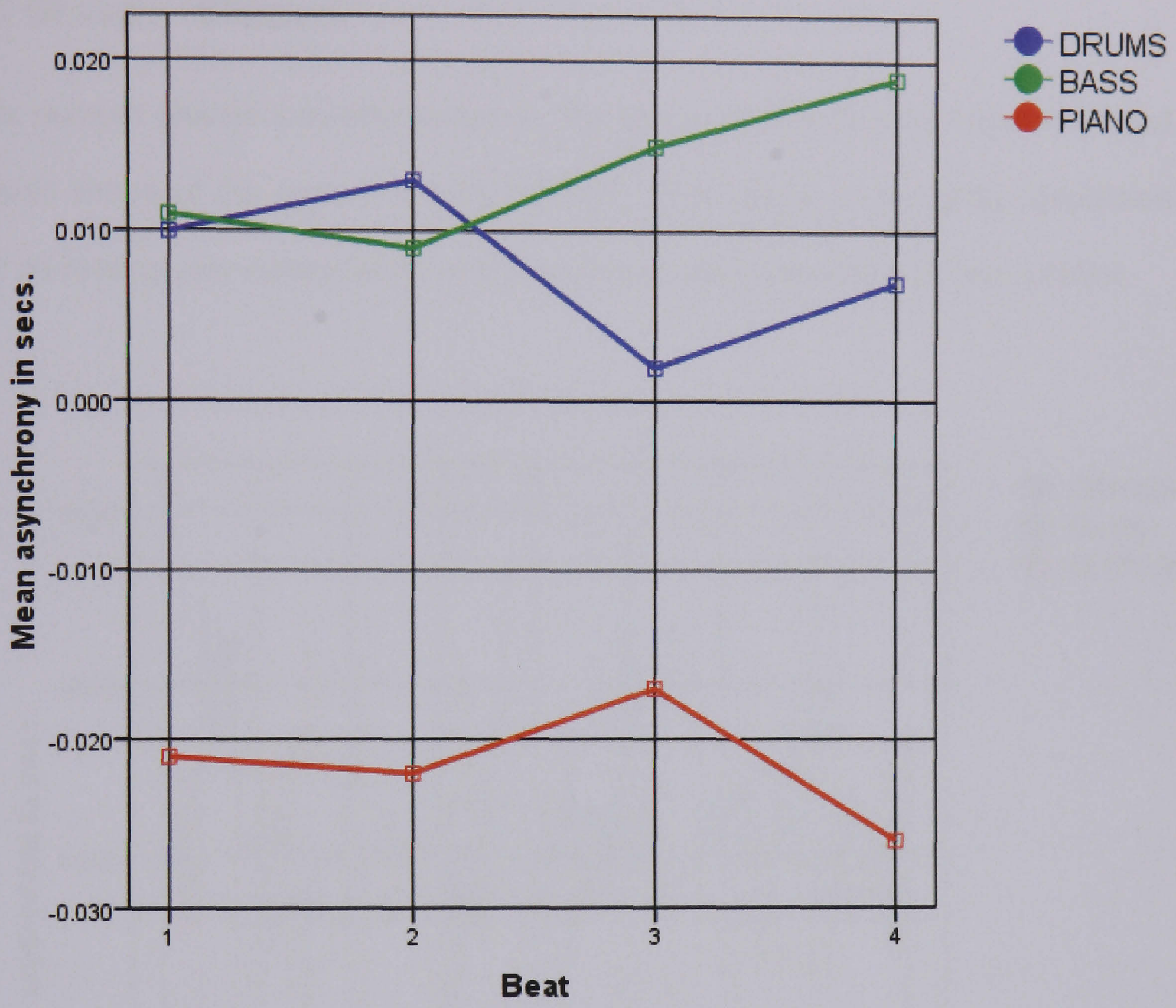
The charts show the two regions within the solo in which the groove was most distinct, Chart 13 shows the region of tighter timing and Chart 14, that of the looser timing.

The tight pattern of timing in this excerpt coincided with the use of the following proximal models, *2 and 4, ten to ten* and *walking bass* (Chart 13) and this was the same phenomenon as appeared in the SC Trio performance in which the strong *2 and 4* and *walking bass* models coincided with a very tight groove at the beginning of the solo. This is the only point in this solo where the drummer plays a conventional ride cymbal and hihat pattern. Elsewhere in the piece, the drummer tends to play in a much freer rhythmic style and this underlines the relationship between proximal models and closer patterns of timing.

Chart 14 shows the notated rhythm patterns being played as the groove widened. In contrast with the SC Trio, the widening of the groove is not accompanied by any distal models and the rate of change in the timing profile is more gradual compared with the rather sudden change in timing relations in the SC Trio in measures 50-57 (see Graph 12). The likeliest explanation for the change in timing is the bassist pushing ahead of the group; this is shown by a slight shortening in some of the individual IOIs of the bass at this point. At other points in the excerpt, the musicians *did* make use of highly polyrhythmic devices but these seem not to have had an impact on the overall groove. This again is in contrast to the SC Trio. The reasons for this could be numerous. One possibility is the relative difference in levels of experience. Although the groove was wider between players in the JD Trio, part of their consistency may lie in their being able to play complex rhythmic figures without losing or gaining time as individuals.

Covert models

As for the SC Trio, I looked at group asynchrony on particular metrical beats (beats 1-4 in each measure).



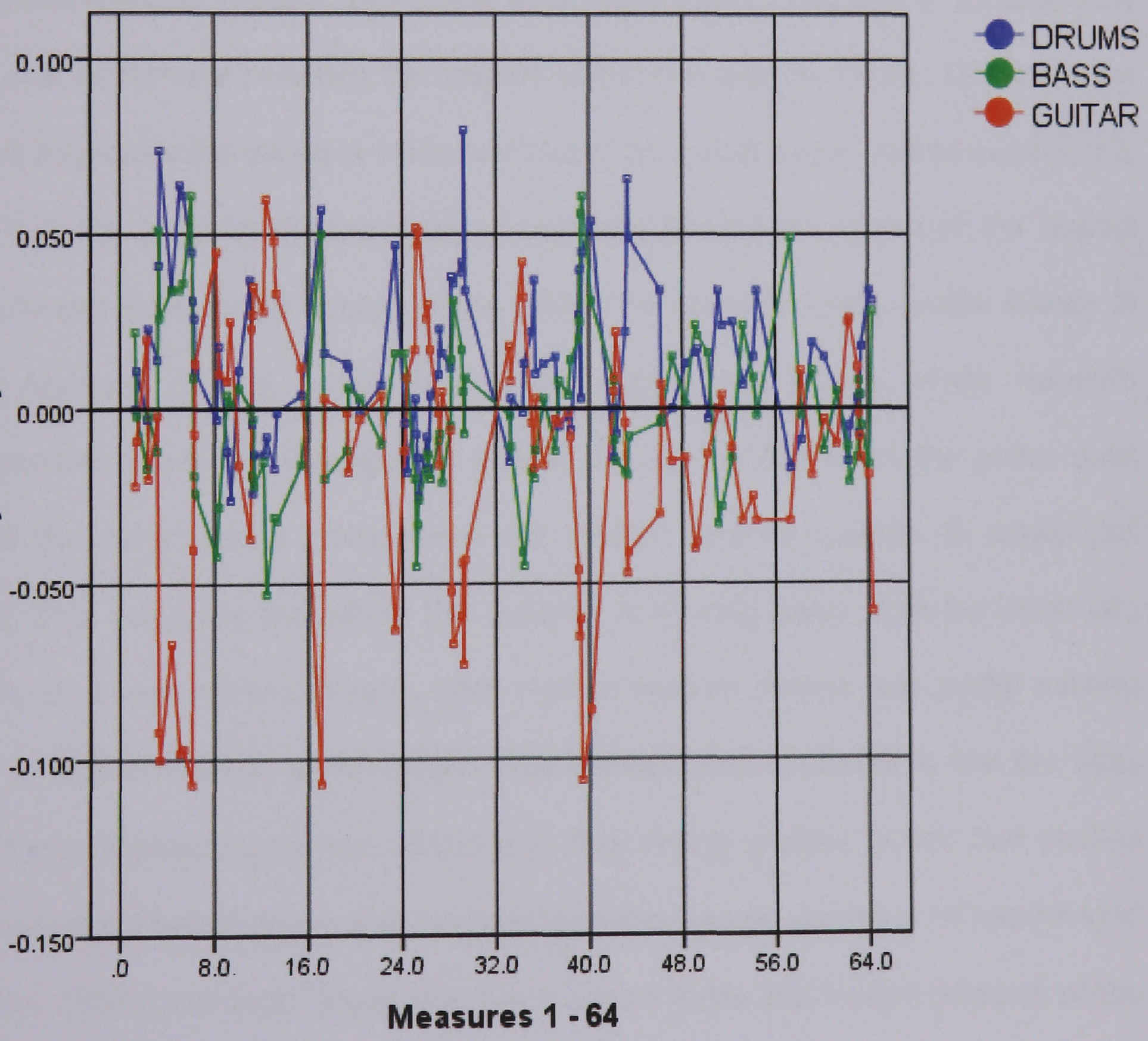
Graph 15. JD Trio – asynchrony as a function of beat.

Graph 15 shows the relational timing of the players for each metric beat. The patterns of timing for both rhythm section players is similar to the profile of the SC Trio shown in Graph 13. As with the SC Trio, there is a clear tightening of the timing on beat 1 but this time only for the rhythm section players who appear to be almost synchronous on the first beat of measures. This is not the case for the pianist who maintains some distance from the other two players on all four beats

but is very consistent in his playing across all the beats; this perhaps squares with ST's description of JD's playing as 'even-ish' (16.01.07).

DC Group – 'Slippers'

This number shared a similar tempo to 'Evidence' yet the temporal dynamics and overall shape of the groove is very different. The bassist in the group described this as feeling very comfortable; all three players were pleased with this number.



Graph 16. DC Group – 'Slippers' groove plot.

	N	Minimum from group mean	Maximum from group mean	Mean asynchrony	Std. Deviation
DRUMS	104	-.026	.080	.014	.023
BASS	104	-.053	.061	-.001	.024
GUITAR	104	-.107	.060	-.013	.039

Table 14. DC Group – relative asynchrony of players from group mean in seconds.

Of the three group profiles, this is the least convergent. There is a considerable width and movement between the players within the groove. Graph 16 shows the relative asynchronies for each instrument from the group mean. In this extract, it is clear that the guitarist moves freely ahead and behind the mean of the overall group timing through the course of the solo. The soloist's timing profile stands in some contrast to the positioning of the bass and drums which maintain considerable alignment through the solo to the extent that when the guitar pulls behind the mean group timing, then the rhythm section appears to jointly pull ahead. This suggests that either the guitarist is moving away from the other two players or a less likely scenario, both rhythm section players are jointly moving faster or slower relative to the guitar. This appears less probable in that the bass and drums showed much less variance in their timing profiles. Given that studies of variance in rhythm production suggest that this can be an index of mental load (Michon, 1966) one could argue that the more complex improvised patterns of the soloist, in their greater demands on cognitive capacity, may lead to greater variance of timing.

Overt models

It was only at one point that the group's time appeared to change dramatically as the result of an introduced model; this was over measures 3-6 where the guitarist plays an unusual five note grouping and this is reflected in the first wide grouping of onsets depicted in Graph 16, between 1 – 8 on the X - axis. This polyrhythmic figure is shown below.

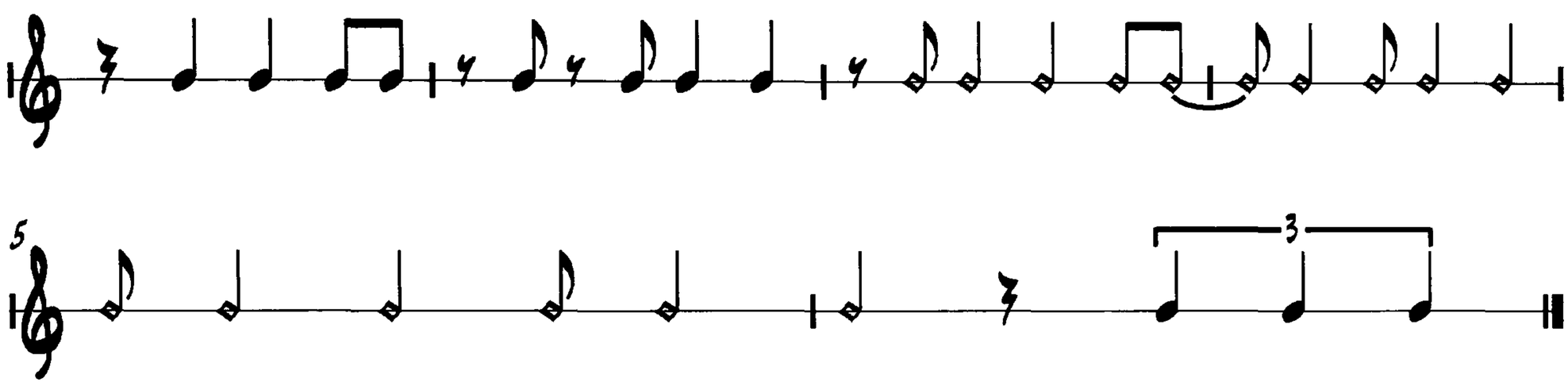


Chart 15. DC Group – five note polyrhythm (measures 3-6) - diamond noteheads display the polyrhythm.

At this point, the groove widens to around .150s which is a considerable gap between the players. This considerable degree of widening happens at two other points in the solo but appears to be the result of covert rather than overt models.

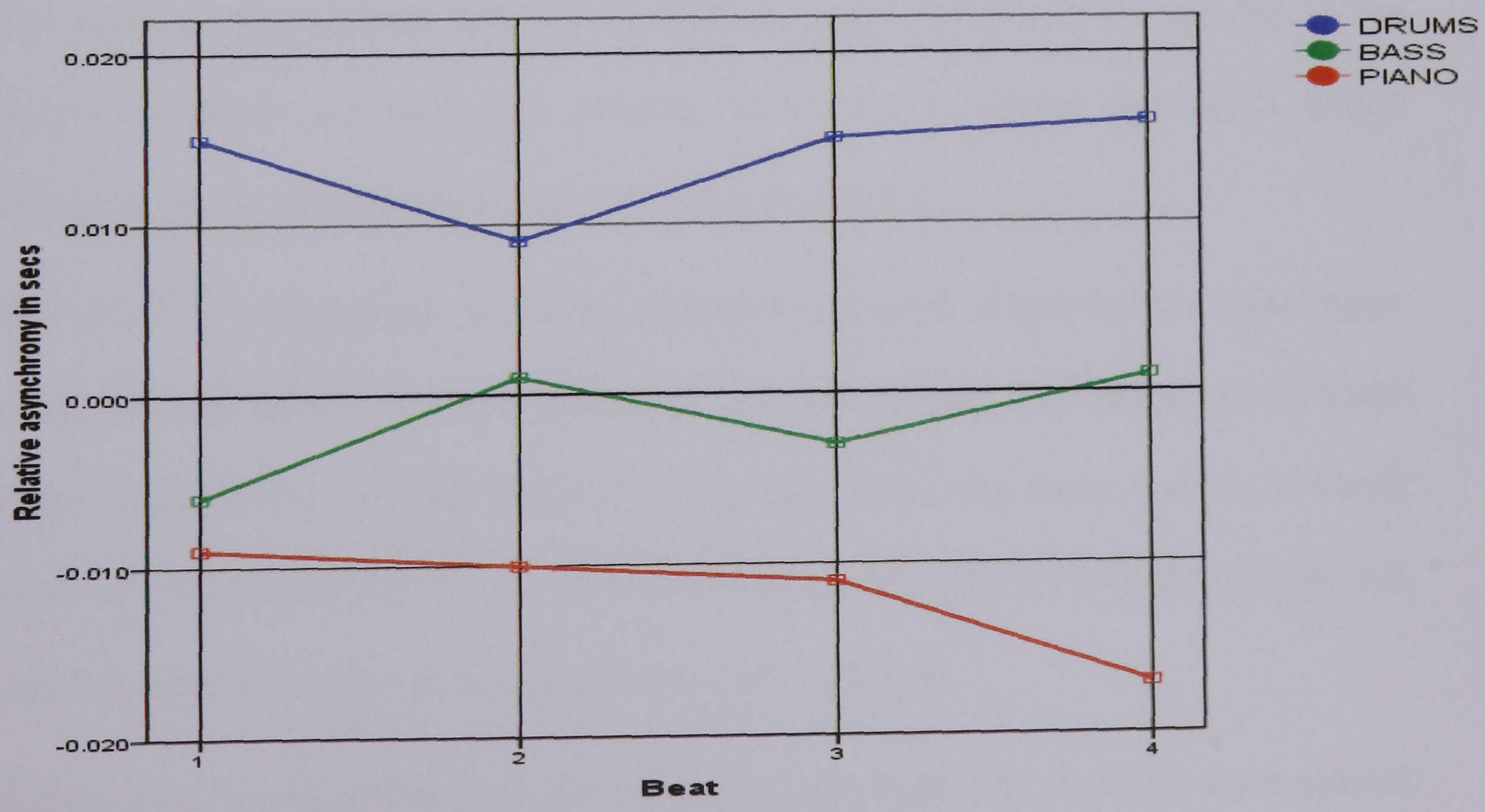
Covert models

At other points in the solo, as Graph 16 shows, there were regular large scale oscillations in which the group feel alternated between looser and tighter states but these did not appear to correlate with particular overt temporal models. However, these larger scale patterns of tightening and loosening do show some correspondence with the 8 bar sections of the solo. Most song structures in jazz are built out of multiples of 4, 8, 16 and jazz musicians tend to work on their phrasing and soloing within such structures. In this solo, although there was no conscious decision on the part of the group to fix the solo length, the solo *is* 64

measures in length which suggests that the musicians were working unconsciously to an eight or four bar hypermetric model. This is also suggested by the 8 measure harmonic structure which is a simple alternation of two chords (4 measures per chord) and is repeated 8 times over the solo.

In the first 32 measures of the solo, there is a consistent alternation between the tight and loose feels as can be seen clearly in Graph 16; the tighter timing patterns between the players coincide with the beginning of each 8 measure section and the loosest parts of the group timing are found mainly in the middle sections of these 8 measure blocks. This suggests the possibility of a much slower entrainment cycle between the players and corresponds to other groove studies that show patterns of entrainment at the hypermeasure (McGuiness, 2006). In the second half of the solo, this eight bar pattern is much less clear and appears to fall away towards the end of the solo.

As with the other trios, I looked at possible effects on asynchrony from metric structure.



Graph 17. DC Group – asynchrony as a function of beat.

The graph shows a quite distinct timing hierarchy between the three instrumentalists. The bassist occupies a middle position between the pushing style of the drummer and the pulled back style of the guitarist. This was widest of the three timing profiles. In this graph, no picture emerges of a significant change in timing correlated with beat.

8.3 Three grooves - summary

In Chapter 3, entrainment was characterised as a naturalised form of intersubjectivity and in Chapter 6, the playing relationships between pairs of players displayed clear evidence of entrainment indicated by the capacity to remain entrained despite perturbations. Perturbations may disrupt the degree of coupling but if entrained, then the relationship will return to a more stable position. While each of the musical extracts so far has been distinct in the quality of the temporal relationships between players, there is no doubt that such group performances can be characterised as highly entrained.

In the SC Trio, the groove could be described as tight, showing the least mean asynchrony per player, but the variance in deviating from the mean placed them between the JD Trio and DC Group. The groove was very consistent up to the B section of the second chorus at which point the timing between players opened out coinciding with the use of particular polyrhythmic devices.

The disturbed timing at the one point where highly fractured rhythms were played by the piano and drums suggests that this temporal model played a strong role in affecting the strength of the coupling between the players. Why should these

particular rhythms affect the underlying entrainment between them? There are likely to be both cultural and cognitive reasons for this sort of temporal disturbance. SC commented in 8.2 on the relationship of polyrhythms and timing and implied that polyrhythms did introduce a different groove. This to me suggested that he felt that part of what makes these patterns work can be the coincident shifts in micro-timing between players; there may be an ideal of perfect timing but the reality is that the groove can change radically when such models are used by players.

The JD Trio showed a subtly different form of group entrainment. Here, the musicians played in a looser set of timing relationships (as shown by the more disparate mean asynchronies) but showed a very consistent set of relative positions, reflected in their showing least dispersal from the mean. In this performance too, there was evidence of an association between the use of particular temporal models and timing states. The group played most tightly at the point where the *2 and 4* and *walking bass* models were employed by the rhythm section but models that implied distance (polyrhythmic figures such as the *dotted quarter note*) did not appear to have any impact on the groove. Perhaps the stability of the overall groove at points where complex rhythmic figures were at work pointed to a greater degree of learning and experience within the group.

The DC Group groove was much looser than the previous two groups; this group showed the greatest spread of timings reflected in the asynchrony of the individual players from the group mean and in the larger Standard Deviations of the players. There was little to suggest a strong relationship between overt temporal models and the groove but in the first half of the solo there was a clear pattern of tightness and looseness emerging over eight measure segments, which may suggest an entraining tendency at much slower timescales than the usual 400-600ms tactus

range. The timing patterns within this group were also suggestive of a rather different approach to thinking about groove. This was reflected to some degree in the interview data when DC spoke of her moving around in relation to the others; this was clearly an intentional part of her playing and suggested some sense of an aesthetic at work in her separation from the rhythm section.

A feature of research into groove, which has been commented on in this study, has been the tendency to view it as structure or process (Keil, 1995; Pressing, 2002). What is clear from this chapter is a much closer relationship between the elements of this binary opposition. The entrainment of players changed as temporal structures changed, whether these were overt or covert, and these changes showed intriguing correspondences between models and timing; as players used more distal models at certain points, then the timing between them correspondingly became greater and as players used proximal models, so the entrainment became tighter. This is not to suggest that there is an unambiguous relationship between models and entrainment. The use of such models did not always result in changes in the groove and there are a number of variables which can impact on timing between players in addition to those explored here (such as variability in motor control). Nevertheless, it seems clear that temporal models at overt and covert levels had effects on the groove between players.

The main focus of this study has been on the sounded behaviours of the players. However, in watching the video material from these performances, it became clear that the groove structures in these pieces were enacted not just in sound but in vision – players moved to the groove and the models contained within it. In the next section, I look at the way in which musicians performed groove visually, and so complete an understanding of the entraining nature of groove, accomplished not only through sounds but also through body moves.

8.4 Enacting groove – body moves

The preceding section has described the complexity of groove in these extracts and the changing temporal relations between players as they worked with covert models that underlay the musical surface (ie the metric beats) or overt models that formed part of the musical surface. In this sense, one can see how the models are sonically enacted in accordance with their syntactic role – distal models invoked more temporal distance, almost as if they were brought to life by the motor actions of the musicians. However, as has been commented on earlier in this study, the sense of motion in live music is not only metaphoric or virtual but is *real* when reinforced by the body moves of the players. At this point, I use some illustrative examples from the performances which reflect ways in which models were enacted through the body in para-musical movements. This is not an in-depth analysis of gesture and movement, but does help convey the full range of modalities at work in the entrainment between these players.

Embodying temporal models

In the video recordings of these extracts, specific embodied moves emerged which tied in with the various temporal models used by the players and also highlighted how groove may be embodied as a group phenomenon.

The *2 and 4* model discussed in some detail in Chapter 7, as an integral part of groove and jazz culture, provides a window into the use of the body to inform and intensify the feeling of such models for the players. AR, bassist in the DC Group, prepared her entry to the guitar solo by tapping the *2 and 4* during the guitar/drums duet which preceded her entry. She commented that the '*2 and 4* is important for me' and she felt 'a very slight emphasis on those beats' (5.10.07)

and so it appears not insignificant that she taps on beats 2 and 4. This bodily preparation of the *2 and 4,* prior to her playing the *walking bass* line, sets up the feel for the walking line that she is about to play. Studies over many years show that there is a close link between body movement and auditory encoding and that the way that humans move influences the perception and feeling of the rhythmic structure (Jaques-Dalcroze, 1921/1980; Phillips-Silver & Trainor, 2007).

Once playing, the model is only intermittently enacted when she nods her head but the movement is clearly marked at measures 9-10, 19-24 and 34-5. The bassist, AR, in discussing the performance, commented on the *2 and 4* being 'rhythmically important' (5/10/07) and it seems that the different forms of body moves are designed to intensify the groove for the player herself rather than being intentionally communicative, although of course, such moves may have some communicative effect for other players and the audience.

Guitarist, DC, in the course of her solo, displays another range of body moves. In a similar display to AR, she mimics the rhythms that she is playing. In particular this occurs in measures 43-44, and 49-54 (see Chart 16 overleaf) in which her head and torso pick out a series of polyrhythmic accents.

These moves appear to be more demonstrative and in measures 49-54 seem to have a communicative content at the point where she establishes a polyrhythmic pattern with the drummer. As discussed in Chapter 7, this type of polyrhythm subverts the regularity of the tactus and these large body movements appear to be a way of intensifying this polyrhythmic phrase. In fact, a number of studies show that even just listening to rhythms (without playing them) involves the same mental processes that are used in generating body motion (Iyer, 2002; Todd, 1999). Given that this performer also spoke in highly motional terms about her playing, perhaps these body moves that align with her phrasing suggest that

cognitive representations of music are more representations of movement than auditory patterns (Baily, 1985). Such movements meshing with the performed rhythms also suggest a *self-synchrony* that is similar to that between speech and gesture (Benzon, 2001), ensuring that the other musicians get as much signal as possible from the combination of sound and body movement.

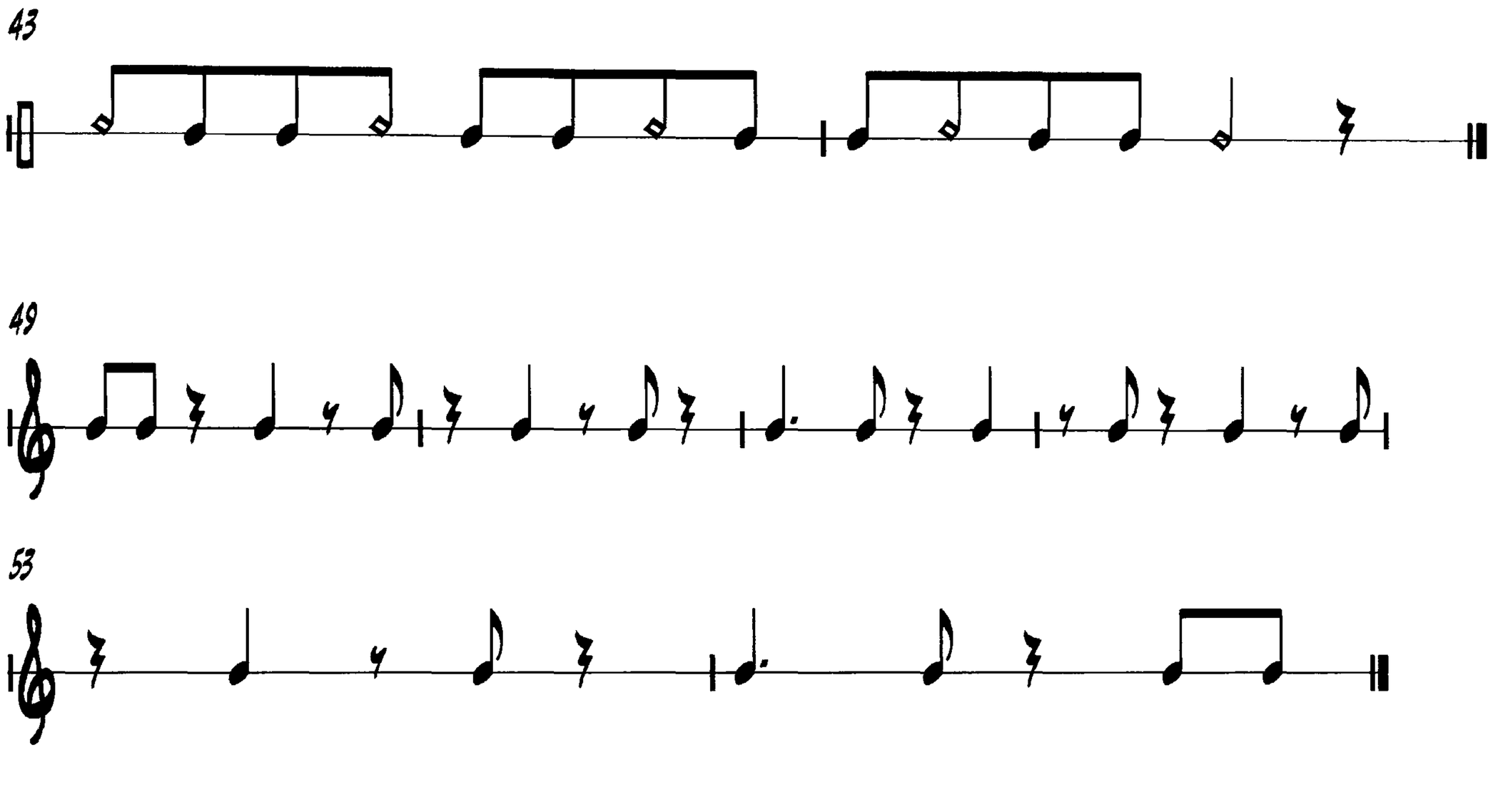


Chart 16. DC Group –guitar solo measures with strong body motion (measures 43-44 and 49-54). Head moves in measures 43/44 are marked by diamond noteheads.

In addition to individual body moves which communicate models or appear to intensify a player's focus, other moves were seen in performance that seemed to directly express the groove *between* players and have been described in terms of *interactional synchrony* (Clayton et al., 2004). In the performance of 'There is no greater love' by the SC Trio (joined on this occasion by a saxophonist), at various points in the piano solo, the players move in an apparently entrained, coherent manner. While their periodic behaviours are distinct, there is a clear communication of the tactus by the bassist, saxophonist and more subtly by the drummer, accomplished through head and torso motion. This appears to be a salient example of the expression of mutual feeling through collective motion. Also

suggestive is the tempo of this piece, around 123 bpm, within the region of maximal pulse salience, suggesting a greater tendency towards locomotive movement in this piece rather than in the other two performances.

While not conveying expressive intentions in the way that more finely graded gestures might accomplish, such large scale body moves appear to be more 'global indicators of expression' and appear in these cases to intensify or clarify the underlying rhythmic framework (Clarke & Davidson, 1998, 79). Both the above examples of self-synchrony and interactional synchrony underline the close fit between movement and rhythm but such moves also contain a social dimension. Davidson has shown how body moves that appear 'natural' can have a twin effect of affirming the performance for the performers themselves but also be suggestive of ease and satisfaction for observers (Davidson, 2001).

Not only were models visibly enacted by the musicians in performance. In interviews, musicians talked of groove as a feeling immersed in the body.

> 'It's a physical feeling and I think it's in the whole of your body really; I don't think you have got a groove until you feel it in your body how it is' (16.01.07).

ST, bassist, in his comments above makes the strongest explicit case out of all the musicians for the importance of groove as embodied feeling. He went on to describe how for him, the sense of groove,

> '…feels like it comes from your chest or something , I don't know why but it feels like it comes from there, but as soon as you've got it, you feel it in your whole body which probably means you almost dance it as an internalised rhythm' (16.01.07).

This is an interesting sense of embodied feeling being a pre-condition for groove. It is only through this feeling that ST knows that the groove is established for him. This intensification of the sounds through an internal dancing or feeling was mentioned by other players. AR explained that she had always

'done loads of stuff that involves singing and I mean it could be singing a groove or something, I was going to say in my head but it is more than that, it's sort of here [*points to chest*] and …I like to have it in here so I suppose that's my whole thing, been about feeling music' (12.01.07).

This bodily feeling of groove however held some slight ambivalence for certain players. If this feeling was expressed strongly by the body, then it was felt almost as an unnecessary interference. BB said that

'from a technique point of view, you need to be loose and not moving too much but when I'm really getting in the groove, I do find myself dancing' (16.01.07).

JD expressed a similar sentiment regarding his moving about,

'I sometimes want to catch myself if I find my body is moving and swaying…..the leg is a bit of a problem [*laughs*], I have been trying to control it but it doesn't behave; some piano players do have an excessively violent leg movement' (09.01.07).

This sense of movement being beyond control was also expressed by DC; she felt that movement

'portrays, betrays the unconscious in some senses you know, because that's an expression of something going on that I'm not really quite aware of you know, I think there's a whole world going on' (12.01.07).

Body movement in these examples above is seen almost in terms of abandon – musicians letting themselves go and their bodies betraying that. In relation to the

idea of movement being 'natural' which was mentioned above, here is an understanding of 'natural' motion that is not entirely welcome for the performers. It appears to be too revelatory and shows the performer being out of control. Later in this chapter, I look at the changes in awareness that accompany groove and these descriptions of unwanted body movement chime with the sense of a reduced level of everyday consciousness that musicians mention. While I do not think that such moves are necessarily indicative of trance, there is an interesting parallel here with the unconstrained movements of trance subjects (Maas & Strubelt, 2006) and these musicians' comments certainly capture the tension between being in control as one plays and losing oneself to the music.

JD in a second interview talked about feeling groove in unmetred music and how that related to body movement. He spoke of the way in which different periodic body movements can appear within a free rhythmic environment,

'I think you can find yourself tapping your foot, you know , a semi-free rhythmic area and you don't quite know where that time is coming from…maybe part of your physiology wants to delineate something in a structure, maybe it's something that simple, I don't know…you kind of have this kind of thing [*rocks forwards and backwards*]. How you would describe it in technical terms, I don't know' (11.06.08).

Without some detailed observation of this sort of periodic body movement that JD associates with playing unmetred music, it is difficult to gauge this example accurately. It is possible that such movements arise as a form of entrainment between players as has been shown in other styles of unmetred music (Clayton, 2007a) or perhaps the rocking response that JD mentioned provides an embodied self-reference point for the playing.

8.5 Feeling the groove

Groove and temporality

So far, the groove in these performances has been assessed through the sounds and movements of the players. Now I want to explore how these musicians felt and made sense of groove in their performing.

The dynamics of entrainment between players has been demonstrated through the sounds they produce and para-musical movements in performance. But whereas entrainment between pendulum clocks or neuronal assemblies remains an unthinking mechanism, in music-making, there are corresponding feelings that accompany this and reveal just how intense the feeling of entrainment between musicians can be. I reiterate my argument here that the feeling of groove that musicians refer to is the *feeling of entrainment.*

In the course of interviews with the participants in this project, I asked each musician for their understanding of groove. The range of responses that I received said something about the richness and significance for musicians of this aspect of playing. In addition to fairly direct questions about groove, the qualities that musicians described in groove came up again and again in the course of the interview. In this section I look at the groove through the verbal reports of the musicians and relate these to the rhythmic sounds that they created.

One of the concerns of this study has been to clarify the relationship between timing and groove; did musicians see groove as arising only through a particular form of timing relationship or could groove occur within any form of time pattern? If the latter was the case, then does it make sense to describe groove in temporal terms at all; does groove arise through conditions other than temporal engagement? In previous studies of groove in jazz involving musicians (Progler,

1995), participants have disagreed about whether groove is derived from playing as synchronously as is possible or whether groove comes about from asynchrony, an inherent messiness that Keil has described in his theory of participatory discrepancies.

A number of musicians in this study had backgrounds outside of jazz or were adept at working within other musical styles. This proved a useful means of sensing what was distinctive for these players about grooving together on a jazz gig as opposed to a rock, funk or world music gig. The observations of musicians on playing in different genres with distinctive temporal feels may help identify the role of temporality in groove.

DC made a number of observations about her own playing within funk and soul music and the correspondence or not with feeling groove in jazz. The first point relates to Michael Stewart's 'groovagram' (see Fig. 2) which describes a set of possible timing positions between a player and 'the beat' (which in his diagram is taken to be the non-negotiable element in music production, the click track). For DC, as a guitarist, her relationship with the drummer in a funk/soul setting and her sense of stylistic correctness involved the careful positioning of the snare and guitar. In this style of music, the groove resembled that laid out by Stewart; in this case, it was the overt temporal model, *2 and 4* , being played fractionally late by both drummer and guitarist,

> 'it all comes from a sort of being aware of micro beats… even though the guitar ostensibly is written as being on 2 and 4 and the snare is there as well, but the way they play it is just a micro second or seconds later, just behind the beat, and I love it and I've played with drummers who have got it down and I love it, you just lock in and I find it really hard with drummers who don't understand that concept' (12.01.07).

This seems to me to be an excellent example of groove emerging from a cultural model *and* a felt entrainment between players. As she explained, it was the shared lateness of the *2 and 4* that set up the feeling of being locked in with the drummer and the feeling of groove was lost with drummers who did not share her precise placement.

The stylistic boundaries for groove are not restricted to micro-placement of notes. One of the key distinguishing features of jazz (and other groove musics such as funk to an even greater degree) is the ideal of metronomic time. BB referred to his experiences when playing Balkan and Russian music and described the process of collectively speeding up or slowing down, making clear that a feeling of groove could still be very powerfully expressed, 'it gives this sort of uncomfortable feeling but this amazingly exciting feeling to the music' (16.01.7). The key was the stylistic agreement of the players to work towards a particular rhythmic goal, whether that be a steady tempo or changing tempo. This chimed with DC's descriptions of groove below as a *shared* but not necessarily isochronous conception of timing,

> 'if you all tend to start a piece at a certain tempo and by the end of the piece you are very slightly faster, and everybody does that and they are not really aware of it, you can get a great groove happening' (12.01.07).

This second example that DC gave underscores the entrained, relational nature of groove. One of the assessments for whether entrainment may be taking place is the ability of the individual oscillators (in this case, musicians) to accommodate disturbance to the entrained coupling. A slow accelerando implies the presence of entrainment between players – if this were not the case, then, as one player accelerates, one might expect the playing between the group to fall apart. DC's words highlight how the experience of being locked together is dynamic rather than static.

DC's feeling of groove in jazz was characterised in a less specific manner than the way in which she talked about groove in soul music; the jazz groove for her was 'a very different sort of thing altogether' (12.01.07). I think there are a number of reasons for this. For DC, her jazz playing was more about soloing than playing rhythm guitar and so groove could not be described in the relatively straightforward way that characterised her description of groove in soul. Her descriptions of her jazz playing have been mentioned earlier but they bear repeating at this point as they seem to indicate to me how the timing between players can be very elastic but still feel groovy. What is incredibly striking about her remarks is the congruence between her words and the timing data taken from her playing,

> 'it is a bit like a wave, that's why I keep thinking of this [*makes wave gesture*] you know, it's like a wave thing where, sometimes you just pull back and let it go again , pull back and then you just come forward and that's *actually what it feels like to me when I'm playing*...and you can only do that by having a real sense of where the actual time of something [is] and being able to keep a kind of a good time, I do have my inner sense of time and with the drums, we are all playing together' (12.01.07; my italics).

This seems to me to be an uncannily well articulated description of the elasticity of her playing as displayed in the timing data. At one point she talked about gigs on which she had experienced a lack of groove in terms of the band 'not gelling'; the metaphor of coldness that she uses below to describe 'not gelling' seemed to me to capture the musical isolation that the lack of groove can yield for players. As she commented,

> 'it would be a bit like if we were sitting have some conversation and it was absolutely freezing cold, you know; it's that thing where something is really starting to distract you from enjoying talking to somebody else because it's really , really cold… if you are freezing there's no real enjoyment' (12.01.07).

This feeling of being distracted on a gig was not confined directly to temporal problems between musicians. DC felt that a band might not gel on a gig 'where the whole band is very loud and…everybody's finding it loud but can't hear themselves…' or on occasions when 'you're too separate, you know, you are spread out too far apart on a big stage and you are not really connecting in' (12.01.07).

In a similar manner, another player felt better able to express groove by its absence. AR spoke of how 'groove is the most important thing, if it's not happening it's horrible…it's almost easier for me to describe how horrible it is when it doesn't happen' (12.01.07). AR gave an example of a bad experience of playing with a drummer. She had some specific ideas of why the performance with this drummer was so unenjoyable. Much of her description of the experience was similarly framed as a form of isolation from one another, in that ' we absolutely didn't feel it the same' and her trying 'really hard, different things – being a bit more pushy, pulling back, playing less, playing more…I just think we weren't on the same wavelength' (12.01.07). Without being able to look at the performance data of the example she gives, it is difficult to know how the timing data might correlate with her experience. Clearly the musicians were entrained (in that they continued to play in time with one another) but in a way that proved very unsatisfying for the bassist. There are a number of possibilities for her feeling that this was a bad experience. Earlier in the study, I have mentioned the idea of

different groove styles having different bandwidths; it is possible that this playing relationship was outside the acceptable bandwidth for AR and this is reflected in her use of the word 'wavelength'. As DC mentioned earlier in reference to groove and tempo, it is not isochrony that is crucial but a *shared* feeling for the time; although the DC Group played with a wide bandwidth, the feeling of the shared time for these players was very positive and perhaps this shared approach was missing in AR's experience of a performance lacking groove.

Following on from this, I was interested to know whether particular sections in the extracts were considered more groovy than others and whether this corresponded to different timing profiles. AS, when talking about the changing time profile in 'Evidence', was very clear that throughout the excerpt, 'the groove was there all the time, that is how I felt it. There was a dance to it' (07.07.08) and this feeling of groove remained whatever the timing patterns that were being played. He went on to explain what he meant, and his feeling of the groove chimed strongly with DC's description of a wave. In his words,

> 'there is a lot of shifting of the time, basically it is like a living organism where it breathes, it goes slow and goes fast, there is a constant getting close and getting further from the beat, from the absolute beat; there is always a sense of furthering from it and getting close to it and that motion, that is the groove...the breathing of the music. Basically, you can play the same bar, the same notes, but you never play them the same, every bar is different' (07.07.08).

He contrasted this sort of playing, which he associated more with Arabic or African music, with

'a machine groove like you often hear in many types of popular music. It doesn't groove like African or Arabic groove played on authentic instruments by people' (07.07.08).

AS also spoke of the need for an aesthetic of change, of tension and release within the music. He spoke of the general importance of changing the musical materials as follows,

'when you play something very avant-garde or very atonal for a long time, you create tension with a nice melody or very diatonic, and the change is basically the release of the tension' (07.07.08).

This corresponded with how he interpreted the change in the timing as was the case at the end of the excerpt from Evidence in which,

'you have a lot of tension and release at the end of the clip. The hot and cold is always something that you play with. I couldn't have that all the time, I couldn't do without the swing all the time, it would be boring after a while, it would be boring unless some other thing comes and breaks it. There is always the feeling of something, the flow and the break of the flow' (07.07.08).

So for AS, just as the combination of atonal and diatonic writing in the music that he played was a mechanism for his being engaged, so the ebb and flow, the breathing quality that he spoke about was the integral component of the music that made it groove. At both levels, there was a sense of the necessity of change and flux. It's important to re-assert that for this player, there was groove **throughout** this excerpt; the groove was not confined to, for example, the very strong *2 and 4* feel accompanied by repetitive patterns but *the feeling of change and elasticity itself.*

This aesthetic of the need for the music to breathe was also described by TS, one of the other drummers. In talking about the groove of 'There is no greater love', TS firstly mentioned the influence of the blues on that particular number, 'Blues, the roots, that feel for that groove, the Blues...the Blues. [*laughs*]' (12.04.07) and the way in which the groove was so insistent that it reached a point of tension that had to be released by his playing in a much looser way,

> 'there's one point in that piece actually where I play a couple of really baggy things...but to me it had almost got to that point in the music that we'd been so right on the tempo [*clicks fingers*] for such a long time, this pressure, this tension had built, and at that point I just went 'ah!' [*laughs*]' (12.04.07).

The above comment was made in reference to his playing under the sax solo (which came just before the piano extract) but applies equally to his playing at measures 55 and 56 (see Chart 12) in which he leaves the ride cymbal and phrases with the piano on the tomtoms and snare (the tomtom phrasing is not shown in the transcription but clear on the DVD (Track 5, 01:59). This chimes with AS' talking of the need for release from one of way playing.

TS also talked directly about the relationship between groove and time. In his view, they were clearly related but there was no requirement to be highly isochronous or synchronous; it was possible to feel a powerful sense of groove and not be playing in metronomic time. The following quote came in response to a question as to the relationship between time and groove. His thoughtfulness comes over as he changes his mind about the answer when he remembers a musical example,

> 'Well you can't have one without the other – that's for sure – you can't have one without the other, really. You see...no actually you **can**. **No,** you can

have one without the other *[gives an example of a tune he had played recently with some musicians in which the timing was very free*] now after a while, that is a certain groove – that creates a certain shape, that momentum creates a certain shape of time, a certain groove, but if you ran the metronome next to it, it wouldn't be going (*sings and clicks like a metronome*), it wouldn't. So for me that's still a groove' (12.04.07).

Pianist JD, made a similar point in describing how free, improvised music that is typically played without a regular pulse nor set metrical structure could groove.

> 'I mean you can be playing free music you know, I started playing free music with a guy who is a flute player who is on the free scene...we did a couple of free duo gigs, and even in a music like that you can create a groove that isn't a stated time; groove that is kind of implying it through the phrasing and hits and the ebbs and flows like 'Trinkle Tinkle' [29] on the recording, I think there's a groove there even though we were not stating a particular time' (09.01.07).

In the light of these comments and the raft of timing data from these pieces, the feeling of groove as a form of temporality emerges more clearly. Firstly, within jazz, the aesthetic seems to demand a very open approach to groove; the discursive positions that the players adopt seem to be about looseness, flexibility and fluidity. While some studies have sought to place groove or swing as a particular form of timing, both qualitative and quantitative data in this study show that the feeling of groove does not arise from a single way of playing together but is more the feeling of an organic coupling between players, inflected by the temporal models that players utilise. It is worth again citing the findings of Warner (1987; cited in Clayton et al, 2004, 13) that interactions that are moderately entrained have a more positive feel than tightly or uncoordinated interactions and

this description meshes very well with the qualitative and quantitative descriptions of groove in this study.

Groove, awareness, and communication

The idea that groove is a rather penumbral aspect of playing music has been mentioned a number of times over the course of this study. Zbikowski (2004) and Monson (1996) have both commented on the difficulties in talking about groove, and Keil reflected on this after a rather unhelpful interview with Bo Diddley, by speaking of the 'elusive reality' of beats and grooves (1994, 106).

Rather than being just another research problem, however, I think that the question of awareness, and the way in which musicians are able or unable to talk about groove itself may be important in understanding groove and its significance. Some musicians in this study specifically talked about groove in terms of a loss of awareness of some degree. Drummer, BB, commented

'when I'm in that sort of state of mind, that's great, it's kind of when you become so absorbed in you know, in the zone of just being totally absorbed in the music and you are not conscious of anything else…it's like you lose the barrier between you and the instrument and you're playing is coming directly sort of from the point of concept of the thought, it's out the end of the sticks and you've played it before you're conscious of having to play it' (16.01.07).

This description of the 'zone' shares some similarities to ideas within sports psychology on peak performance or the notion of flow that Csikszentmihalyi has developed (2002). Csikszentmihalyi comments on music as a form of flow, focusing more on the presence of flow when people listen to music (ibid, 108-112) and it is clear from his work that groove can be seen in the way that BB describes

it, as an activity in which there is a loss of self-consciousness and an absorption in the task in hand.

Another player, AS, describes a similar loss of self-awareness when playing and grooving but intriguingly talked of this in terms of 'communication' which was not used in its more usual sense of transmission-reception. In his words, it was rather a 'moment when you are aware of what is happening but in that awareness you don't exist anymore' (02.07.08). AS' discussion of the idea of communication was framed in abstract language but he related these ideas directly to his playing in the trio. For him, the pianist and bassist in their different ways had communicative qualities of acceptance, simplicity and in his words, 'make me play in the same kind of manner and it feels like I can be free to do whatever I like without thinking 'is this right or wrong?' (02.07.08). This description of communication and the accompanying sense of liberation may appear more appropriate to the world of religious experience but it also appeared to share some common ground with others' descriptions of groove. SL, bassist, shared common ground with AS' ideas,

> 'groove is probably communication, you know, communicating a feel, communicating that feeling to whoever's listening or to yourself or to each other…and I think that is groove' (12.04.07).

Whilst SL felt that he was 'trying to find that in the music most of the time' (12.04.07), he also acknowledged that this was something that could not be forced,

> 'I think the thing with groove is that you have to let it happen, it's almost a case of not doing too much to get in the way of it' (12.04.07).

Thus groove was interpreted by this player as a quality to be sought in performance but one which could not be readily achieved by trying. Finally, SL

spoke of groove being like a 'rut' (12.04.07) – which of course is synonymous with a meaning of the word groove itself. In Ingrid Monson's 'Saying Something', she comments that 'Once established, there is something inexorable about groove' and this sense is underlined here by these musicians (1996, 68).

These performers' reflections on awareness and communication when playing groove (and indeed music as a whole) raise intriguing questions about the relationship between entrainment, awareness and engagement with others. In Chapter 7, it was discussed how the structures that go to make up groove can be highly discursive; they form part of a body of intersubjective knowledge which jazz musicians require to become part of this music culture. This contrasts with some of the descriptions above about grooving in which the emphasis is on an absence of knowing or thinking. Is this absence tied to the very nature of entrainment? Does entrainment lead to not thinking? Clearly, one can see parallels between the idea of flow and even trance with the above descriptions of playing without thought and the fact that one of the musicians found it easier to describe the experience of groove *not* happening perhaps suggests that as entrainment between players is smoother and less disrupted, there is consequently less information for cognitive processing. These sorts of reports of entrained musical behaviour leading to a loss of awareness are interesting in the light of studies of musical attention by Jones which suggest that regular, well structured music may lead to 'future-oriented attending' in contrast to less structured music which results in 'analytic attending' (Jones, 1992; Jones & Boltz, 1989). The former can be likened to a getting the 'bigger picture' whereas 'analytic attending' involves a focus on fine detail. My point is speculative but perhaps the experience of 'future-oriented attending' is accompanied by a reduction in awareness of task, and perhaps 'analytic attending'

is similarly accompanied by more self awareness. This interesting point requires further research.

8.6 Groove and mechanisms of meaning

Mechanisms of meaning

In the final part of this chapter, I close with a discussion that relates to the second of my research questions – the way in which musicians derive meaning from groove. I have proposed that groove results from the entrained behaviours of musicians and that in fact when musicians talk about the feeling of groove, they are describing the feeling of entrainment. But by what process do they feel this entrainment as meaningful?

In Chapter 4, I examined the idea of cultural models and cognitive mechanisms that may be associated with the internalisation of shared cultural models; in accordance with general usage in cognitive science and psychology, I termed these internalisations, 'schemata'. I now return to the work of Lakoff and Johnson and Barsalou since both of these approaches have something distinctive to contribute to an understanding of the internal processes through which meaning is generated. These two approaches are complementary but have different foci. Lakoff and Johnson's work particularly relates to the way in which linguistic meaning emerges from embodiment whereas Barsalou's work integrates embodied states and social affect, seeing both of these elements as mutually interactive.

Experiential realism

In 4.3, I gave a summary of the theory of experiential realism, developed by George Lakoff and Mark Johnson. In the light of what musicians have said about the experience of groove, how does their work shed light on the process by which musicians derive meaning from groove?

Much of Lakoff and Johnson's work on metaphor uses the everyday language about people's lives to challenge the notion that figurative language is essentially poetic, not designed to reveal 'real' conditions in the world. Their work confronts the assumptions of analytic philosophy that language should be described in terms of its truth conditions, a key precept of much linguistic and philosophical investigation. The challenge comes through their assertion that everyday language, and even philosophical language is grounded in metaphorical terms, terms which are evidently false if analysed as being truth conditional.

The relevant part of their theory, which I feel can be extended to make sense of musical communion, deals with the cognitive underpinnings of such metaphorical talk. The most significant aspect of their work has been to propose that understanding occurs through the transfer of basic bodily experience to other experiential domains; we understand relatively abstract concepts such as love, time and music through tangible, bodily experience. The metaphors that are used in everyday speech are a linguistic form overlaid onto these fundamental thought processes. This is a particularly powerful theoretical perspective on the generation of linguistic meaning out of an embodied activity such as playing music.

Within experiential realism, the idea of an image schema has been tied to bodily experience of the self. Their idea however can be taken further. If one extends their original notion of an image schema to go beyond experience of one's

immediate bodily self to include the proprioceptive, aural and visual sense of being in time *with one another*, what might be termed an *intersubjective image schema*, then one can see how the fundamental being in time with others that cuts to the heart of jazz and is felt so powerfully across different modalities becomes an engine of meaning for musicians. In contrast to many of the image schemata described by Lakoff and Johnson, this develops only through engagement with *others*, not engagement with gravity or the material world.

The bodily experiences of enjoying shared time with others are heightened not only through repetition but the multi-modal bodily perceptions of this state. Jazz musicians, as is clear throughout this project and from preceding ethnographic studies of jazz interaction, have an acute sensitivity to variations in timing and microtimed relations between one another. Most of the musicians in this study distinguished between their awareness of time relations and groove as audience members and as players. ST commented on this divide,

'I think it makes a massive difference which side of the stage you are… there are drummers I play with that feel as though they are a bit behind… and then there are drummers that seem to be ahead and I feel where my place is to either hold it down or to push it ahead …I think it is quite hard to tell from the audience if that is happening' (02.07.08).

This suggests that the sort of experience that jazz musicians cite when they play together is largely inaccessible to those not playing. But why should playing in time together yield powerful experiences? At this point, I go back to Trevarthen's work. Much of his work on development hinged on the social becoming that arises in infancy and is observed in the very earliest infant/carer interactions. Such intersubjective body experiences form an experiential template for social life – an intersubjective image schema. This sort of initial experience can be seen as the

basis for the various feelings of engagement that musicians talk about in relation to groove. The entrainment that we experience in playing groove together traces its lineage to the experience of entrainment and mutual exchange between infants and caregivers, and the relatively abstract feeling of groove therefore acquires concrete meaning at a fundamental level through our repeated, lifelong experience of sharing time with others in an everyday manner.

Groove is meaningful for these musicians through its being a sonic, visual and proprioceptive analogue of sociality. When musicians talk of the groove being 'loose' or 'tight', these are not just spatial metaphors; they are informed by the same sort of image schema that underpins our feelings of sociability. When musicians in Ingrid Monson's work speak of groove being like 'walking arm in arm' (1996, 68), this has resonance because both groove and walking down the street require a shared image schema of 'togetherness' to be meaningful.

The experiential realism of Lakoff and Johnson contributes to a coherent explanation of why groove matters. Through the language of sociality and proximity used by these players to describe groove, one can see how the image schema derived from social proximity, feelings that we enjoy from the earliest periods of our lives, can be engaged to make sense of musical proximity and thus a whole linguistic repertoire which describes groove makes sense through its initial associations with primary physical and social contact.

Perceptual symbol systems

Barsalou's work on perceptual symbol systems is a not dissimilar account of how cultural meanings arise from embodiment. His account of social embodiment is a

useful complement to the linguistically oriented work of Lakoff and Johnson. As a model of cognitive process, it is also a more developed account of meaning generation. Barsalou's approach is relevant to musical performance through his understanding of the way in which embodied states play a crucial role in social communication.

Whereas Lakoff and Johnson see the emergence of linguistic meaning through embodiment, Barsalou sees embodied states arising from linguistic cues and vice versa. It is not my intention to go back over the discussion of Barsalou's work that appeared in 4.3, but rather use some brief examples from the performance extracts to illustrate how Barsalou's approach offers a useful theoretical model for how the sounds and movements in performance generate meaning.

The first example is of the entrained body moves of the players in the SC Trio performing 'There is no greater love'. The description of such moves is set out earlier in section 8.4. For Barsalou, the coordinated movements in this extract are significant not simply as a response to social stimuli (such as playing music together) but in the capability of these movements themselves to trigger affective and cognitive states. Researchers have shown that different forms of movement can powerfully affect cognitive and affective process; for instance, studies of horizontal and vertical head movements show that they have cognitive/affective impact of respectively negative and positive valence in message evaluation (Wells & Petty, 1980); similar research has shown that positively valenced words are associated with pulling actions and negatively valenced words are associated with pushing actions (Chen & Bargh, 1999, cited in Barsalou, 2003, 57).

In the SC Trio extract, three players nod their heads to the beats and I would suggest that such movement is important not just for feeling the time but for social meaning on a number of levels. Firstly, in a culture that understands head nodding

as an approving movement, such moves may enhance the affective value of the performance for players and audience; studies such as those by Wells & Petty (1980) clearly demonstrate the unconscious, affective impact of such moves. If such movements are also aligned between players, then one could imagine a further increase in positive affective result arising from individual moves being coordinated. This example speaks again of the fact of loosely synchronised body motion between conspecifics promoting a feeling of ease and participation (Warner,1987; cited in Clayton, Sager & Will, 2004, 13).

A further example of social/embodied states interacting comes from section 6.6 in which different players talked about the effect of authority and role on their timing and sense of groove. Players talked of the inability to play time in situations where others were perceived to be of higher social standing, assessed as their position in the jazz world. The examples that musicians gave of losing ability to play show how motor performance can be profoundly affected by the meaning of social stimuli.

8.7 Summary

This chapter has explored the temporal, motional and experiential qualities of groove in the performances of the participating trios and considered mechanisms of embodied cognition that offer explanatory insights into how musical experiences such as groove can be meaningful.

The temporal data on groove yielded a number of results that are significant for the study of timing between players in improvisatory settings. Firstly, that the fundamental groove between players, which I have characterised through the use

of an entrainment model, is an exceptionally fluid form of shared timing which is connected with the ways in which the musicians utilise the temporal models of jazz. Such models were described in Chapter 7 as having particular dimensions which encouraged a sense of proximity or distance. The proximal/distal dimensions of the models not only were apparent at syntactic levels, the difference between a quarter note and dotted quarter as they appear on a score, but were also implicated in the groove changing its temporal shape over the course of performance. Particularly striking was the way in which proximal models brought a corresponding tightness in the timing and distal models encouraged a widening between players. Another important finding was the degree to which both overt (that is clearly forming part of the musical action) and covert (structurally significant but framing the actions of the players) models contributed to the temporal shaping of groove. As well as the overt models that musicians deployed, both metre and hypermetre appeared to play a substantial part in the elasticity of groove that players talked about.

The videos of these performances illustrated how groove between players is not just heard but also seen. I briefly examined examples of players moving in these extracts which revealed the embodied, motional aspects of groove. Players appeared to use body movement both as a way of intensifying their focus or feeling for the groove but also appeared to use body movement as an apparatus for communicating temporality and sociality.

The way in which musicians in this study talked about groove showed that the relatively crude definitions given in the Introduction to this thesis, like so many definitions, were rather anodyne about an aspect of playing that has profound meaning for players. From the range of thoughts that the musicians shared about their experience of groove and also from the timing data, it has become clear that

different forms of being in time together can yield the feeling of groove. The entrainment between players is sufficiently loose for it to become a highly expressive device within performance and it is sufficiently felt by players that they are able to say such a lot about the experience of groove and shared timing. However, it is important to note that some players expressed views about their relative positioning in the groove that did not always correlate with the objective data.

Groove for these players however was not simply about timing. It engendered change in players' levels of awareness and some players understood groove to be part of musical communication. Some players expressed their feeling of groove as almost entirely bodily; this was not necessarily a description of bodily movement but a feeling that groove emerged from the body rather than the mind – it was felt more than known.

The final part of this chapter linked contemporary theoretical understandings of meaning generation with the performances and I suggested that both Lakoff and Johnson and Barsalou offered convincing accounts of the ways in which bodily experience can become socially meaningful. By extending the experiential realism account to include intersubjective image schemata, for example, the embodied experience of being in time with others, then one can see how such repeated experiences that have social resonance allow us to make sense of a relatively abstract feeling such as groove. Barsalou's theoretical work is complementary to experiential realism but focuses on the generation of meaning in social encounters ,such as music, as the re-enactment and re-association of prior experiences stored in modally specific areas of the brain, allowing bodily, affective and cognitive states a full part in the understanding of social cognition. Both accounts

have a part of play in understanding the musical meaning and importance of groove.

In the next chapter which concludes this thesis, I address the relevance and implications of this study for music research.

9. CONCLUDING DISCUSSION

9.1 Relevance of the study

The central aim of this study has been to understand the nature of groove and how musicians derive meaning from this state. While other aspects of jazz performance, the II-V-I chord progression, AABA song form, and even the iconic swung eighth note all seem readily accessible to theoretical understanding, groove appears much more resistant. Even those musicians who experience this feeling of shared temporality and place groove at the heart of their music-making find that it is complex to understand.

Groove, though it may seem rather ineffable, is an important part of understanding music and its study addresses a fundamental aspect of musical experience and meaning – that is the collective nature of music-making. Much of the study of temporality in music, especially psychological approaches to performance, has been directed either towards temporal structures or production/perception within individuals and consequently, there has been a neglect of the manner in which musical temporality is so thoroughly grounded in joint action. This study has paid attention to these individualised approaches to temporality, but only in the service of the eventual aim – to understand the nature of shared experience and meaning in music-making.

In addition to contributing to a general understanding of collectivity in music, this study is also important in its contribution to understanding groove itself. Existing studies of groove have emphasised the collective nature of performance and there is no disagreement with authors such as Keil or Monson about the shared experience of music-making. Indeed this project has been greatly influenced by the insights of these researchers. What I hope to have done within this narrower

field is to offer new insights into the nature of groove by developing perspectives through the work of phenomenologists, cognitive anthropologists and cognitive scientists.

The central research questions within this study were framed as 'What is the nature of groove?' and 'How do musicians derive meaning from it?' These questions had their origins long ago in my thinking about time and groove during my work as a player and in many discussions with other musicians about music. They found further focus within this project through my engagement with particular writers who challenged orthodox understandings of jazz and groove. Although this study has been informed by a wide range of ideas, it was the work of Charles Keil, Ingrid Monson and latterly Lawrence Zbikowski whose rather different approaches to groove and interaction encouraged me to question how groove might be better understood; in this study, I have attempted to explore the gaps left by these and other researchers and develop methods that could help achieve those aims.

Methodological importance of this study

From a methodological point of view, the researchers cited above stopped short of grounding their approaches to groove in the empirical investigation of timing. Ignoring this sub-syntactical level missed perhaps the most crucial aspect of groove for musicians – that is the subtle, felt interplay between players. The timing data in this study provides objective correlates to the verbal reports of the players as they describe this interplay. Without this data, derived from the actions of the players, then the words of musicians about what they do would have remained just figures of speech.

The methodology used here was expressly designed to overcome these unresolved issues and aimed to use public performances as the basis of my data collection. While the timing data could have been gleaned more easily by recording each of the bands within a controlled environment, the experience for the musicians would have been attenuated. If the interview and timing data was to reflect their working lives, then I needed to have a sense of how they performed in the real world.

Each of the musicians was interviewed in some depth (all but two of the participants was interviewed twice) about their understanding of groove, timing and their interaction with others. At each interview, participants were also replayed video clips from their performances. In this way, it was possible to frame some of the interview questions around specific instances within the performances. One of the problems in interviewing musicians about their work is the difficulty in discussing musical experiences which almost by definition involve some sort of change or even reduction in self awareness. By bringing the interviews from a general discussion about groove and timing to particular examples of such within the performance, it was possible to come close to the musicians' feelings over certain pieces and at certain points in the performance.

I referred earlier to the tendency of much music and music psychology research to look at individual player's behaviours. Much of this research on individuals often in studios was necessarily driven by the difficulties of live recordings with groups – the problems of noise compared to signal, the separation of sounds, the difficulty of using large scale recording equipment within the context of performance – all these factors rendered much detailed analysis very difficult. The analysis done here with recordings made *in situ,* and with as little interference from the recording process as possible shows how to produce a sophisticated analysis of musicians

in concert together without the drawbacks imposed by ecologically restrictive studies. The considerable triangulation of qualitative and quantitative data has also demonstrated that fruitful work can be developed, integrating analysis of the experience of musicians with the sounds that they produce.

Contributing to Theory

The works of each of the three writers mentioned above, Keil, Monson and Zbikowski approached groove from different perspectives but each attributed a form of sharedness to the concept. This attribution was most explicit in Keil's ideas on participation. With his use of Levy-Bruhl's (1910) earlier work on participation, Keil set up a distinct theoretic framework for sharedness that has informed much academic writing on musical interaction. However the idea of sharedness could also be found implicitly in Zbikowski's writing by his proposing groove as a form of shared knowledge and in Monson's work in the way that groove was informed by the nature of interpersonal experience. I have taken these elements of their work but attempted to theorise more fully this idea of sharedness.

In so doing, I have used the concept of 'intersubjectivity' since it carries a theoretical weight and context that is missing from the more vernacular 'sharedness'. Using intersubjectivity as the coordinating term, it has been possible to explore the subtleties of shared musical endeavour in a fully theorised framework.

Firstly, it accommodates the different levels of awareness in groove through the distinction between primary and secondary intersubjectivity characterised in Chapters 3 and 4. Within groove, this distinction between levels of awareness can be seen in the relatively pre-conscious 'just being in time together' through to the

discursively available temporal models which musicians make use of. Secondly, it articulates the experience of a distributed system such as groove; groove only occurs as a relational experience and it is through the partial contributions of each musician that it can occur. Thirdly, intersubjectivity speaks of the commonality of meanings for a cultural group; it is through experiencing others as analogues of ourselves that we can make sense of our subjective experience and apply it to the world.

So in using the intersubjective as a rich theoretical way in to groove, I feel that my perspective stays in touch with writers such as Keil, Monson and Zbikowski but provides an additional important contribution to the theorising of groove.

9.2 Findings

Timing

Keil suggested that groove resides in the 'out of sync-ness' between players; Progler asked whether groove arose from tensions in the timing or was an expression of the tightest synchronisation between players. So what was the relationship between timing and groove that emerged from this study? In beginning to answer this, I looked at what I termed the temporal preconditions of groove in Chapter 6. These were the individual timing profiles of players, the timing relationships of the constituent units of the trios (intra-rhythm section and between soloist and rhythm section) and the overall tempo of each performance. These different profiles yielded useful answers to how these players worked in time together. Firstly, the results showed that individual timing varied most according to role. Consistency was generally greater for those players in the

rhythm section than soloists and that there appeared to be a correlation between the degree of playing experience and individual consistency. In developing these timing skills, the musicians had over the years used different practice methods which ranged from singing, to regular metronome work and playing along to CDs. Whatever the method, it was striking how all the players paid great attention to the quality of their timekeeping. Although most players valued metronomic precision as a musical ideal, it was understood that there was more to timekeeping than being a metronome.

Roles -rhythm section and soloist

Groove is generally understood to occur through conditions of timing between players and so having established individuals' timing 'credentials', I looked at the timing relations between pairs of players, within the rhythm section and between soloist and rhythm section. In looking at these distinct relationships, I introduced methods of description and analysis drawn from entrainment theory. There was a clear division between the closeness within rhythm sections and the looser coupling between soloist/rhythm section.

Within the rhythm sections in this study, each entrained relationship between bass and drums represented a subtly different form of being in time. In the SC Trio, the bassist and drummer had worked in an almost exclusive relationship for about four years and displayed the tightest coupling; in the JD Trio, the bassist and drummer had played with one another infrequently but over some years and in the DC Group, the rhythm section had almost no performance experience together. The tightness of the playing between rhythm sections showed a correspondence with the length of time that players had worked with one another in the same way that

individual consistency showed an association with level of playing experience. Noticeable were the different spatial relationships within each rhythm section which did correspond broadly with Keil's intuitions about particular pairs of players having set ways of playing with one another. However, more timing data would be needed to establish whether such patterns were consistent across different tempi, styles and gigs.

Between soloist and rhythm section, the timing data revealed quite different forms of playing together. Most extreme was the DC Group; the guitarist played very freely on top of the rhythm section, perhaps a pointer to her rock/blues background where soloist and rhythm section enjoy more distinct roles. In the other groups, the soloist/ rhythm section relationship was more regular. In the JD Trio, this relationship was characterised by the pianist consistently playing behind the rhythm section whereas in the SC Trio, the ahead/behind pattern was evenly split.

These different soloist/bassist phase relationships suggested that there was an impact of playing style and understanding of role on the microtiming positions of the players. It was clear from the comments of the players that each had a way of soloing that brought in the rhythm section in a different way. It was also clear from the way in which some of the players talked that keeping good time was not just viewed as a skill to be deployed; it was a lens through which players made sense of their playing relationships with others. In this respect, some musicians spoke of the relationship between one's authority in the group and timing, and their comments pointed to the fit between social being and musical performance.

Structure and process

In the literature and in the way that musicians talk, groove tends to be seen as a process or a set of structures. One of the exploratory themes in the project was to enquire about the relationship between these two conditions.

What has become clear from the data is the tangible way in which structures and processes are implicated when musicians groove together. There is no simple relationship between the two and there was no simple change in the entrainment process through the impact of temporal models. However, at certain points, there were clear effects of structure on process. In the SC Trio, the only point at which the basic entrained group profile widened coincided with the employment of a polyrhythmic model, suggestive itself of distance, and in the JD Trio performance, the tightest timing between all group members co-occurred with the drummer and bassist introducing, for the only time in the piece, both the *2 and 4* and *walking bass* models. Both of these examples show how the sense of 'tightness' and 'looseness' were replicated at both the timing and syntactic level, and were suggestive of how sensorimotor skills and abstract knowledge may work in tandem to produce powerful feelings of 'togetherness' or 'apartness'.

There were a number of structural forms at work in these performances. As well as looking at the temporal models that were introduced by the players, I also investigated the 'covert' models in these extracts. Expression in classical piano playing has been shown in many studies to reflect underlying structures within the music. Could the same be said of metrical structures and song forms in jazz? The timing data suggested that for some of the players, there was a relationship between metrical structure and the tightness of their coupling. This sort of pattern also appeared at the hypermetric level. In looking at patterns of tightness and looseness in the DC Group, there was an intriguing alternation of these patterns

coincident with the 4 bar harmonic structure in the solo. This was certainly suggestive of a larger scale pattern of entrainment within the group that corresponded with larger scale harmonic and/or metric structures.

Groove's meanings

The second key question of the study asked how musicians derived meaning from groove. The answers that players gave broadly divided into those that emphasised some temporal aspect, those that focused on levels of consciousness or communication and answers that included a sense of the embodiment of groove.

For some of the players, the essence of groove appeared to be a form of temporal relationship but although groove was about co-temporality, it did not mean that players needed to be synchronous or isochronous for the music to feel groovy. While players held up ideals of metronomic time and this is what many of them aspired to, groove was not felt in the same way. Groove was felt often to be an elastic, organic experience between players. All that was required was some *shared* feeling for this elasticity of time for a sense of deep coordination between players to emerge.

More surprising was the language used to describe groove that was not about temporality but rather about forms of consciousness. Players talked of the experience of groove in terms of 'being in the zone', of 'being alive in the moment' or even of 'communication'. Was there a correspondence between these different feelings of awareness and the more prosaic descriptions of shared temporality? My own feeling is that both forms of description may be a different articulation of the same experience of entrainment and may simply reflect players' different preoccupations with musical experience. The descriptions of groove as forms of

action focused on playing as being elastic, organic, as smoothly running cogs and so on. The figurative language that players used squared with the timing properties of these groups – loose but on the whole smooth couplings. The descriptions of groove that focused on consciousness often intimated a sense of reduced or unmediated awareness and this similarly speaks of a process in which the sensorimotor system is provided with less rather than more information – a process of redundancy through repeated experience. This would square with accounts of trance that similarly look to entrainment as a source of altered states (Becker, 1994).

Some of the players emphasised groove as a strong bodily feeling. It is commonly held that groove is the feeling of motion engendered by the music and that an indicator of groove is the body movement of players and audiences. Although the detailed analysis of body moves was not the focus of this study, I have shown that musicians' movements can be loosely tied to the different temporal models that are deployed in performance. In so doing, the discursive, sonic and visual elements of these models are brought together in different modalities which can further strengthen the shared experience of playing together.

Finally, in examining how groove is meaningful, I looked to cognitive mechanisms that might ultimately explain how groove's meanings are grounded within embodied schemata and also social embodied communication. I argued that shared, enacted temporality and para-musical movement provided the raw materials for the embodied theories of Lakoff and Johnson and Barsalou; these respectively were used to account for the figurative language that musicians used in describing groove, and the mechanisms whereby body moves came to influence and be influenced by affective and cognitive states amongst conspecifics.

The nature of groove?

So what is the nature of groove? At the beginning of this study, I offered some preliminary thoughts about groove which were drawn from musicians' talk and dictionary definitions. In the course of this thesis, I hope to have brought new understanding to this rich and complex arena of study. At risk of reducing this elemental part of jazz to a one-liner, I finally add my own definition for the reader. I hope this neatly summarises the thesis and offers a more informative definition than those I began with. In summary,

'Groove is the musical feeling of entrainment, inflected by intersubjective temporal models, and expressed through the cultural norms of jazz.'

9.3 Future directions and final comments

Studies of this kind inevitably throw up new questions and problems that need addressing but are beyond the current scope of the work. In these final pages, I want to outline three possible areas of future research that surfaced in the work but could not be accommodated within it.

Firstly, in Chapter 7, I described the way in which the tactus level of timing could be seen as corresponding to the basic level category. Research into categories has been dominated by examination of the visual modality, although recently, Zbikowski has extended the scope of this work into music research in his linking musical motives to the basic level. A fruitful line of research is now suggested by my own work and this would be to explore the tactus, as the key entraining level, through the notion of the basic level. Such work could extend the notion of the

basic level to include not just conceptual, categorical knowledge but embodied knowledge, and perhaps therefore offer a novel account of why entrainment is meaningful.

Secondly, the thesis explored the ways in which musical role modulated timing between players and asked questions of the musicians about their roles. Within the scale of this project, I felt it important to restrict my analysis of role to the narrow confines of timing but issues came up around the nature of musical authority and identity that could be developed more fully and lead into a more socially informed study of timing between players.

Thirdly, there was an issue that came up tangentially to the focus of the project. In interviews, a number of musicians spoke of their experience of time and groove outside jazz, indicating quite different temporal styles and forms of knowledge within different communities of practice. My sense is that a project that examined separate music scenes and their use, transmission and learning of temporality across different genres could be a fascinating development from this work.

This study has sought to understand groove through the examination of temporal relations between musicians in performance and the musicians' own reflections on these. The timing data speak of an ever shifting dynamic state between players in which looseness and tightness, aheadness and behindness are constantly modulated as players enact models that make up the groove structure. Theorists and musicians have spoken of groove as a structure or a process but this research has shown that we need to think of groove as a dialectic, a continual synthesis of process and structure.

The processual mechanism put forward here is that of entrainment. Entrainment has been explored by cognitive scientists, mathematicians, biologists and social psychologists in different ways but all recognise its capacity to explain

fundamental interactive behaviours at many levels and within many systems. Entrainment provides a theoretical basis for why we are able to play in time together at all; it grounds the intersubjectivity of playing within a naturalised framework. Entrainment is adaptive; as a cognitive and social mechanism, it allows for the elasticity of timing that has been observed in the timing data within this study. It is not however unconstrained. Perceptual and sensori-motor limits put a boundary round the potential for temporal engagement and how it may feel good or not.

Jazz musicians work within a loosely structured temporal environment. I have characterised this environment as consisting of a network of temporal models. Such models provide a structural framework for grooving but it is clear from this study that such structures penetrate and are penetrated by timing processes. Particular models suggest congruence and others promote a feeling of incongruence and this is reflected at both the level of syntax and at sub-syntactical levels of timing.

Different studies of jazz have pointed to the elusive nature of groove and there may never be complete accord about what it means to play and to speak of groove. What I have attempted to do in this work is to offer an account that promotes a cognitive explanation and socio-cultural interpretation, that integrates timing data and musicians' experiences, that brings understanding to a complex but not impenetrable world of timing and finally celebrates humanly organised sound and the extraordinary skills and commitment of those who shape it.

Notes

Chapter 4

1. See London (London, 2004) for a general exposition of a cognitive approach to metre and rhythm and specifically on our propensity to *metricise* or, as he prefers, *subjectively rhythmicise* (pp 9-26).

Chapter 5

2. Two of the participants did not respond to my request for a second interview.

3. The Spin Jazz Club, Oxford, is a venue I have been co-running for nearly 10 years. It has been an excellent resource for the project by providing a local base for me to record some of the bands in this project. The band that participated in the pilot study were already booked in for a date at the club as I began to set up the pilot. The musicians in this group were very happy to participate in the pilot.

4. I adopted the protocol of using initials in the interests of confidentiality as I was unsure of the extent to which sensitive matters might come up in the interviews. Musicians were happy with this arrangement. With hindsight, given the relatively neutral nature of the interview data and the fact that some of the musicians are reasonably well known, the use of initials seems to have been an unnecessary step. In the interests of consistency, however, I have stayed with this method of identifying the players within the study.

5. A German jazz record label with a sufficiently identifiable house style that it is a useful shorthand for many musicians in pinpointing a distinctive European sound in world jazz.

6. This set-up was not possible for every performance. As an alternative, we used one PD 170 set up as a fixed camera or a Sony Hi8 video camera similarly mounted on a tripod.

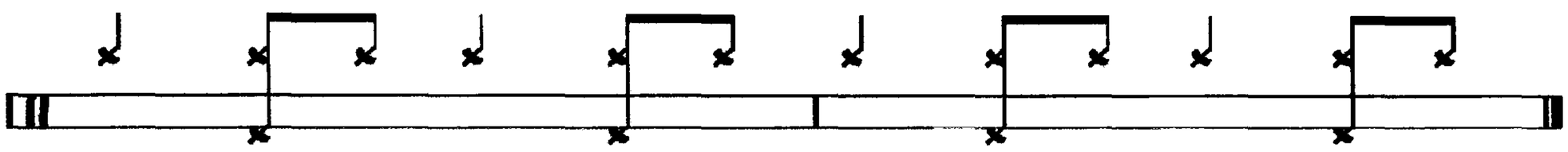
7. Avid is one of the industry standard audio-visual editing platforms. Within the Avid software environment, video material could be edited and then output for DVD, webcasting etc.

8. A simple code was created to denote measure, beats and subdivisions. The first number indicated the measure with a backslash followed by beats/subdivisions.

9. Rhythm transcriptions for each of the performance extracts are contained in Appendix 2.

10. The 'Experience and Meaning in Music Performance' Project is a 3 year AHRC funded project at The Open University and the overarching project within which this and a number of other studies have taken place.

11. '2 and 4' refers to the subtle emphasis with which jazz musicians mark out these beats as they play. This emphasis may be brought out by any of the players within the group but its most overt form is associated with the drummer's hihat played in conjunction with the standard ride cymbal pattern. This temporal model is explored in more detail in Chapter 7.



12. 'Broken time' refers to the contemporary style of playing ride cymbal which dispenses to some degree with the traditional ride cymbal pattern and instead supplies a pattern which is more integrated with the snare, hihat and bass drum. The overall sound is less regular and more dynamic. A consequence of this style of playing is the requirement that the other players in the band should not rely on the drums for keeping the beat. See Riley (1997) for a more complete exposition of 'broken time' playing.

13. The practice of substituting a self composed melody for that of a well known standard whilst keeping the same harmonic changes has been a consistent feature of the jazz tradition. Perhaps the most notable example is Gershwin's 'I Got Rhythm' which has become the basis for innumerable tunes within the jazz canon whilst the basic harmonic structure is retained (the form of 'I Got Rhythm' is also invariably shortened to 32 from 34 bars by losing the final two bar tag). Amongst jazz musicians, the set of tunes based on the 'I Got Rhythm' harmonic structure is often referred to as 'Rhythm changes'.

14. This process of reharmonising the conventional chord changes of a standard is central to the jazz aesthetic. The 'substitution' of one chord for another may only be used for a few chord changes in the piece or may involve a complete reworking of the harmony.

Chapter 6

15. Billy Cobham (1944 -) is widely regarded as one of the most innovative drummers of the last 30 years. In particular, he was known for his formidable technique and speed around the drumkit, hence the jokey comment.

16. The click track is a digitally produced metronomic accompaniment, usually heard through headphones, which studio musicians typically employ to ensure a stable tempo through the performance. As a perfect timekeeper, the click track can also be effectively used to gauge the relative time positions of players.

17. The process involves the conversion of different categorical durations to a single category. In this case, the quarter note was used as the unit of comparison so any greater durations are divided by the appropriate multiple. For example, a half note lasting 540 ms is divided by a factor of 2 yielding a normalised quarter note IOI of 270 ms. See Clarke (2004) pp 81- 83 for a summary of the procedure.

18. Ray Brown (1926-2002) is considered to have been one of the greatest bassists in jazz. His signature was a strong propulsive walking bass line played right at the front of the beat.

19. 'Baggy' was used by members of the SC Trio to mean 'loose', a more common description of a groove in which players exhibit some freedom in their rhythmic execution.

20. A pick-up band refers to the common practice of a soloist, typically a saxophonist, booking a rhythm section for a one-off gig in a club or bar.

21. The legend ' Δ 2 observations' refers to the multiple observations being displayed by a single triangle.

Chapter 7

22. 'Changes' are the usual term that jazz musicians use for the chords in a piece. More imaginatively, they are also described as 'Norfolks'; any self-respecting user of rhyming slang will see the connection!

23. 'Fusion' refers to a mix of styles that developed in the early 1970s, largely out of the experiments of jazz musicians such as Miles Davis in their re-working more dance oriented rhythmic styles.

24. 'Funky' is used here to mean Black Atlantic groove music with a strong backbeat, usually based around the 1/16th note subdivision.

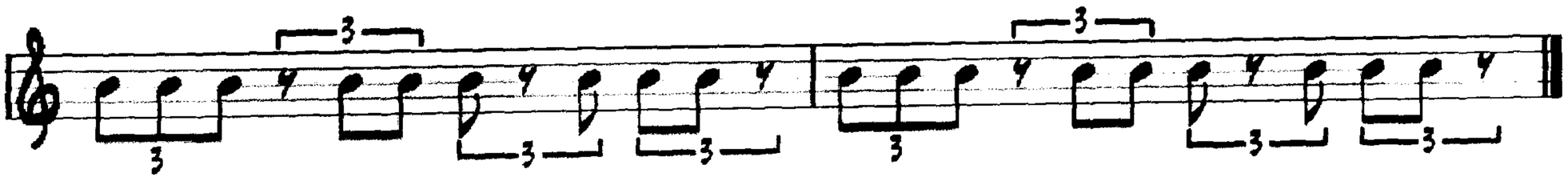
25. The cross-stick played on the snare is also often referred to (incorrectly) as a rimshot. The cross-stick stroke is achieved through resting the butt end of the stick on the snare head and then striking the rim of the drum through the raising of the tip of the stick as though hinged at the butt end. This results in a dry 'click' sound. Its use on beat 4 within the standard jazz drum pattern is exemplified by the playing of Jimmy Cobb, most famously on 'Freddie Freeloader' from Miles Davis' 'Kind of Blue' album.

26. In salsa, *Montuno* refers to the repeated harmonic figures played on the piano, the rhythmic ground. The *timbalero* plays the timbales, thin single-skinned drums, and at certain points in a salsa piece may play highly syncopated, extravagant rhythmic figures.

27. The 'head' of a jazz number refers to the melody or theme played at the beginning of the piece, prior to the improvising and at the end of the piece.

Chapter 8

28. The *abakwa* pattern involves a repeated 4 beat triplet pattern as follows:



Note that this is not the terminology used by the player in this performance. I have used this as a shorthand to describe a grouping of four eighth note triplets with the final note tacet as this corresponds to the same African pattern of this name.

29. 'Trinkle Tinkle' by Thelonious Monk was performed with Evidence as part of a medley of Monk tunes in both recorded performances by the JD Trio. It was played in a very free style.

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A1 - Interview questions and formatting

Questions

1. Timing

a. Development

Is timekeeping something you have consciously worked on as a player? If so, in what ways?

b. Musician's individual timekeeping NOW.

Jazz musicians talk about players being behind, ahead, or on the beat; can you identify yourself within those sorts of descriptions?

How do you feel about your 'time' as a player now ?

c. Time within the group

Can you say something about how the time of others in the band feels to you? Do you have a sense of where they place the beat?

Do you pay attention to anyone else in particular as regards timing?

Can you say something about how the group works on time?

2. Groove

a. Personal sense of groove

What does groove mean to you?

b. Groove in performance

How conscious of groove are you within performance?

So, do you actively work towards it when you are playing? Is it a conscious goal?

If the music is grooving, how do you generally feel?

- Do you display those feelings?

If the music is not grooving, how do you generally feel?

- Do you display those feelings?

Do you think that groove is more likely to happen if you are playing with people you feel good with, or does it happen independently of how you feel about other players?

[Further questions were tailored to the specific performance extracts]

Formatting of interview transcript citations

Ingrid Monson has written about the complexities of representing the comments of African American jazz musicians within the interracial context of American society (1996). The transcription issues in this study are considerably easier than those experienced by Monson but nevertheless require some explanation.

My approach has been to leave cited comments verbatim and in cases where verbatim quotations were unclear, I have very lightly edited the comment. This has generally involved taking out repetition, conversational fillers that did not yield information and so on. Since the study did not involve a discourse analytical approach, then I believe that this contributed rather than hindered understanding.

For comments that required clarification of gesture, reference to other musicians, and indexical comments that were unclear, I have inserted an italicised description within square brackets. Clarifications that were purely linguistic, added to make sense of a phrase are given in square brackets without italicisation.

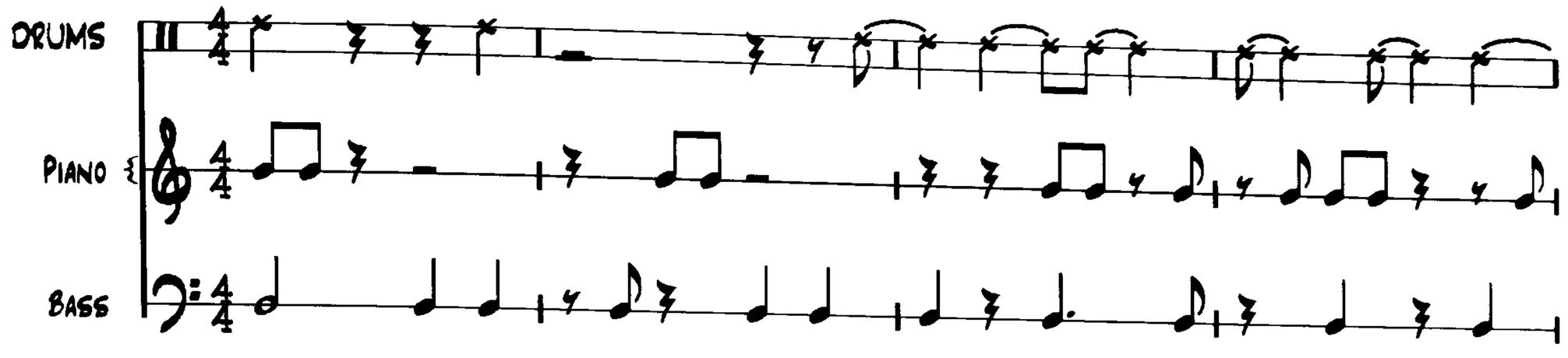
All quotations from the transcripts are accompanied by the date of the interview in brackets.

A2 – RHYTHM TRANSCRIPTIONS

2.1 JD TRIO

EVIDENCE

THELONIOUS MONK



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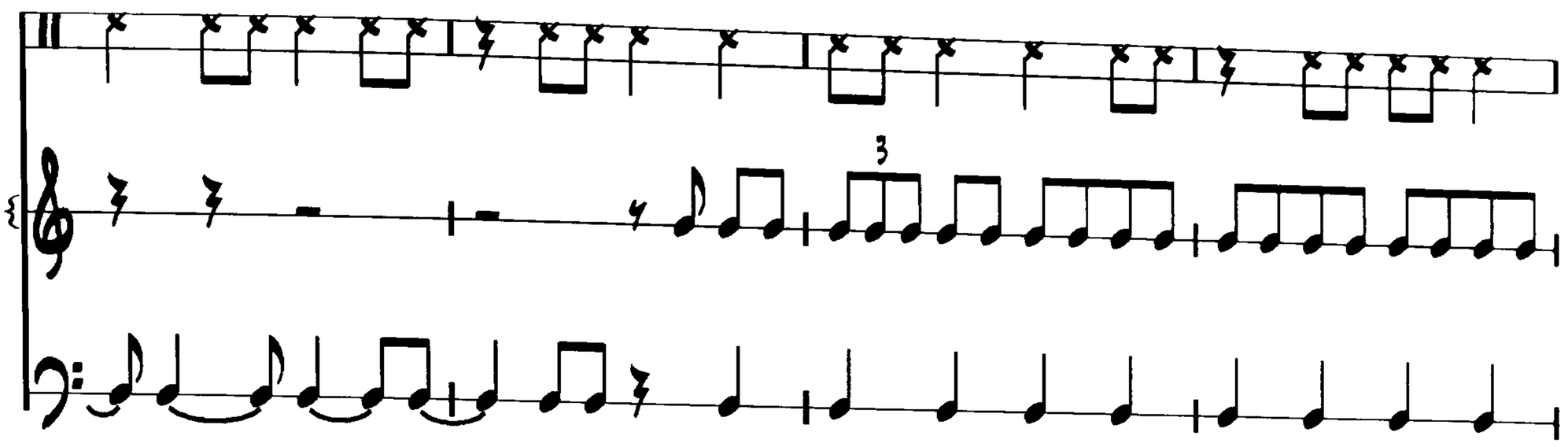
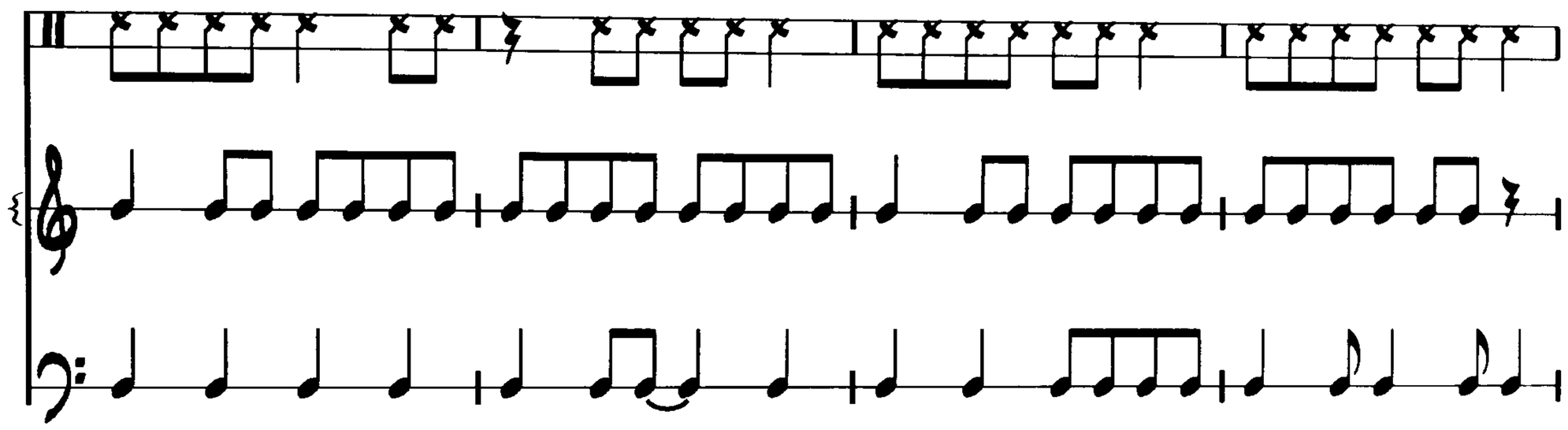
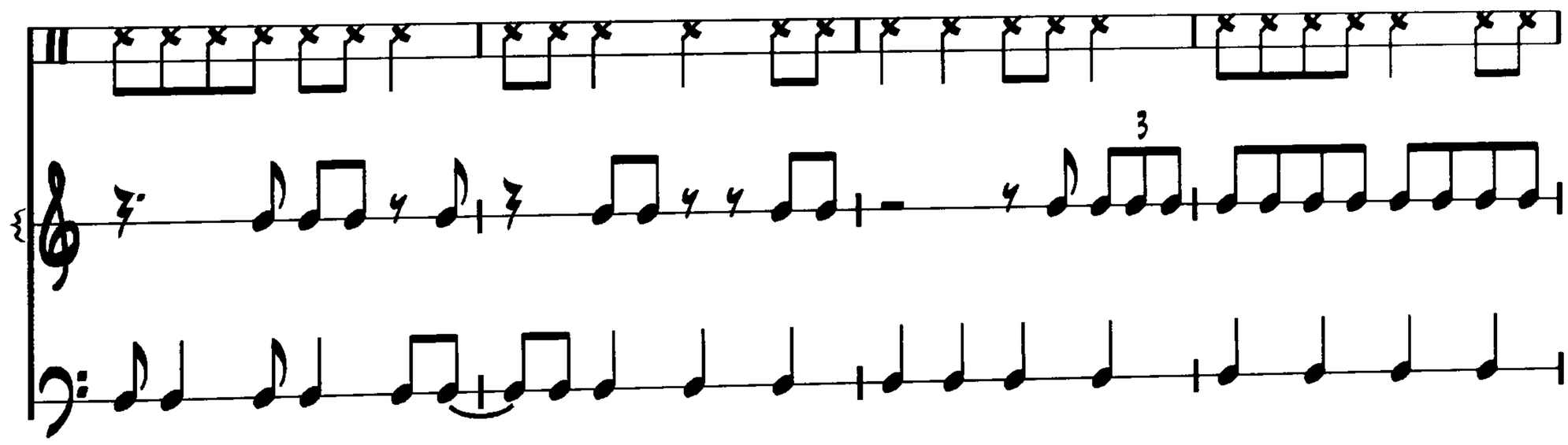
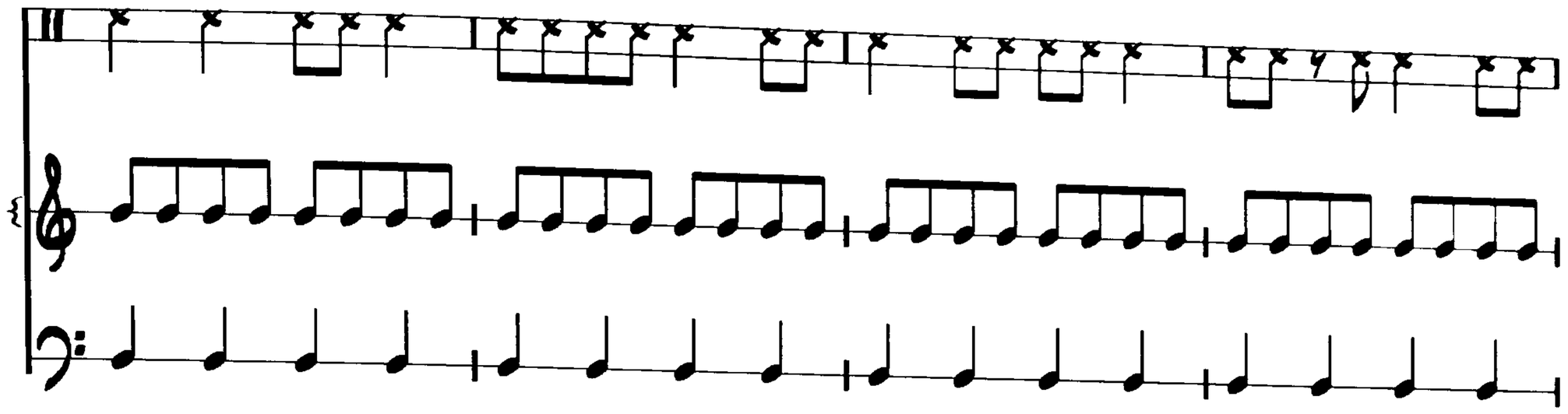
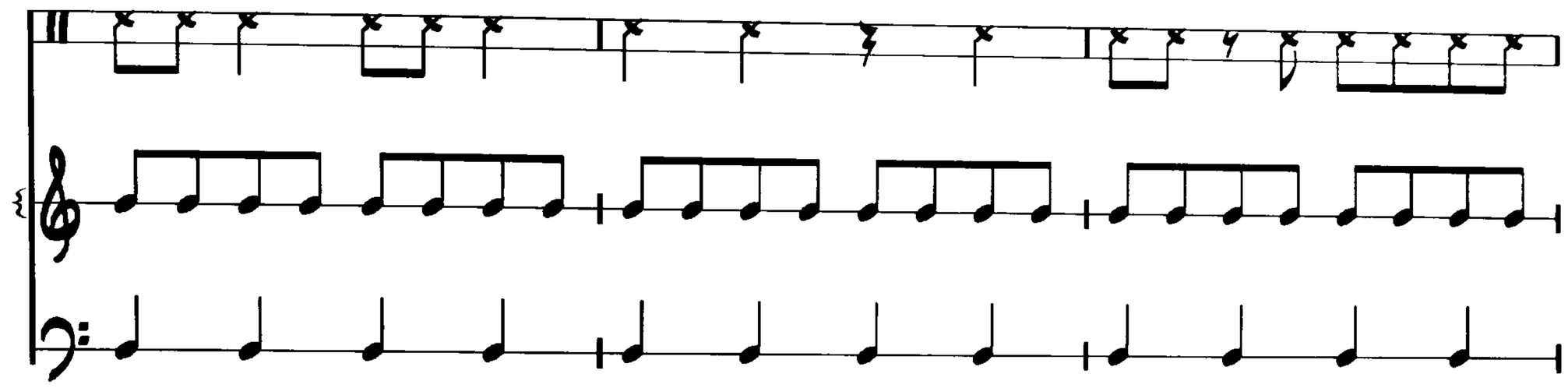
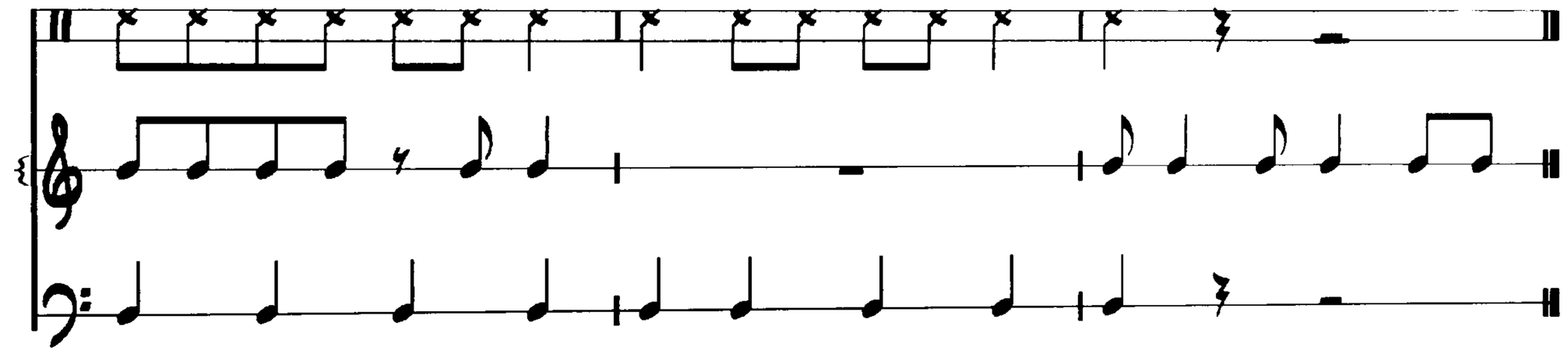








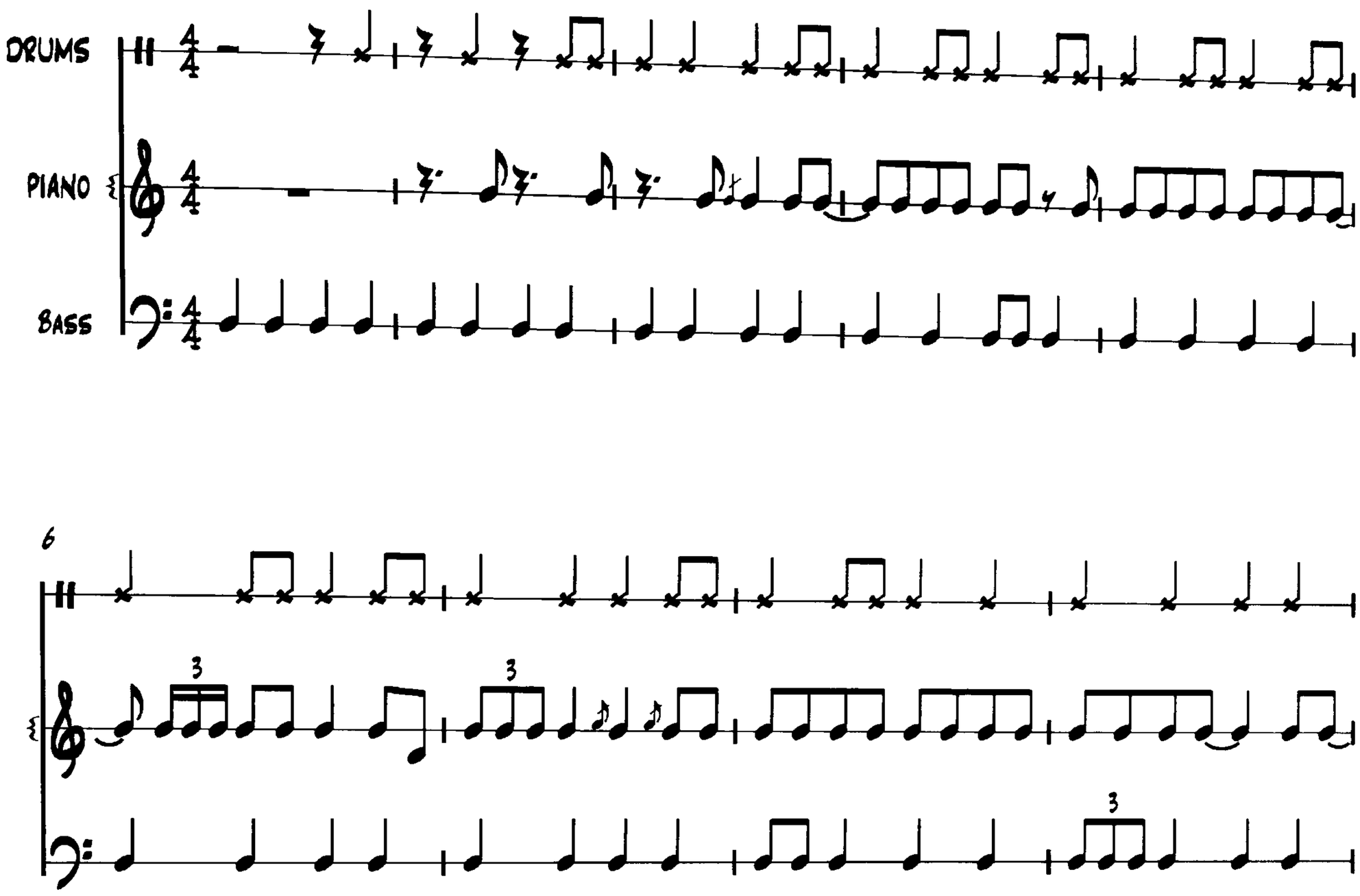




2.2 SC TRIO

THERE IS NO GREATER LOVE

SYMES/ JONES



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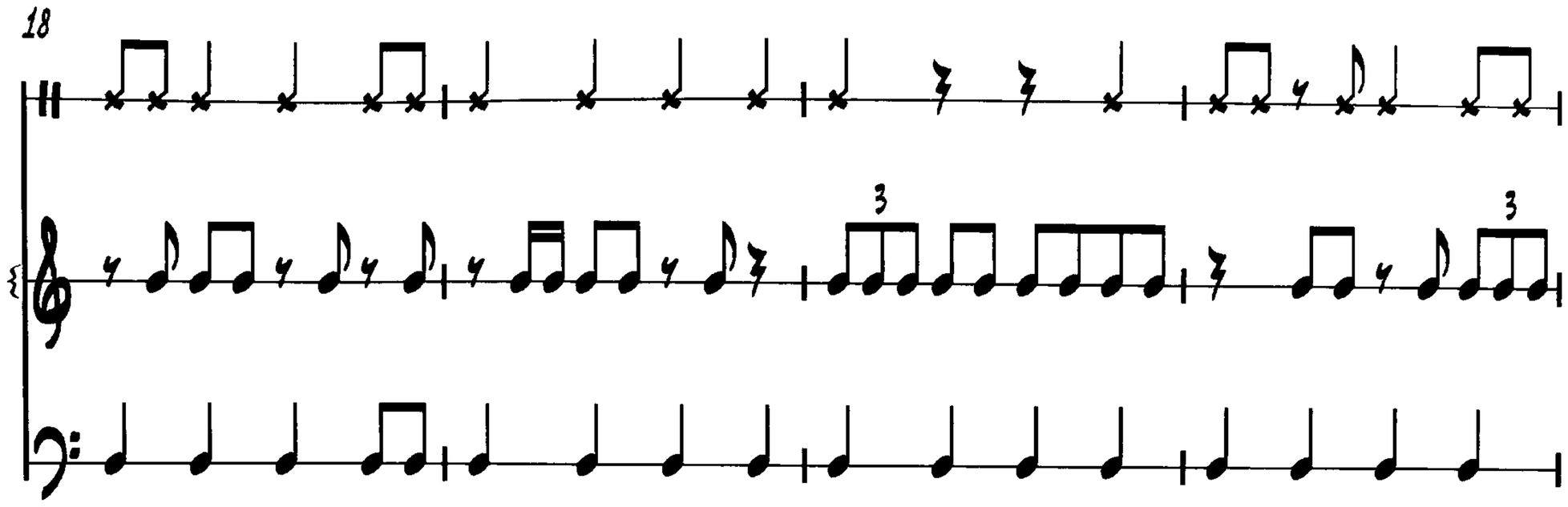

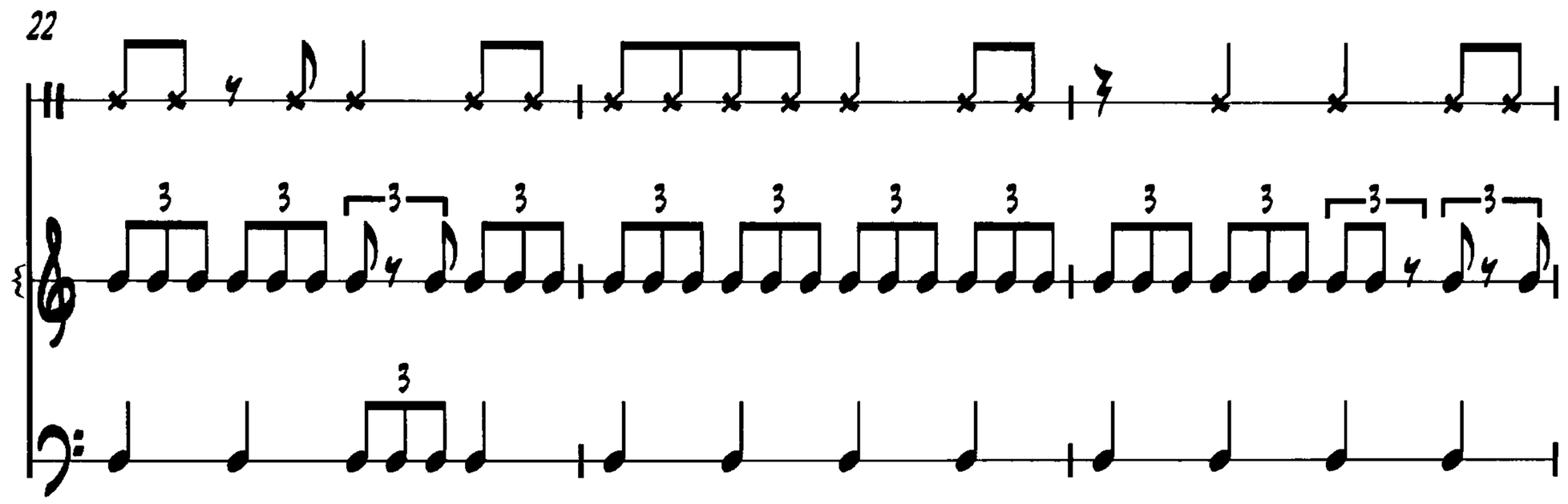

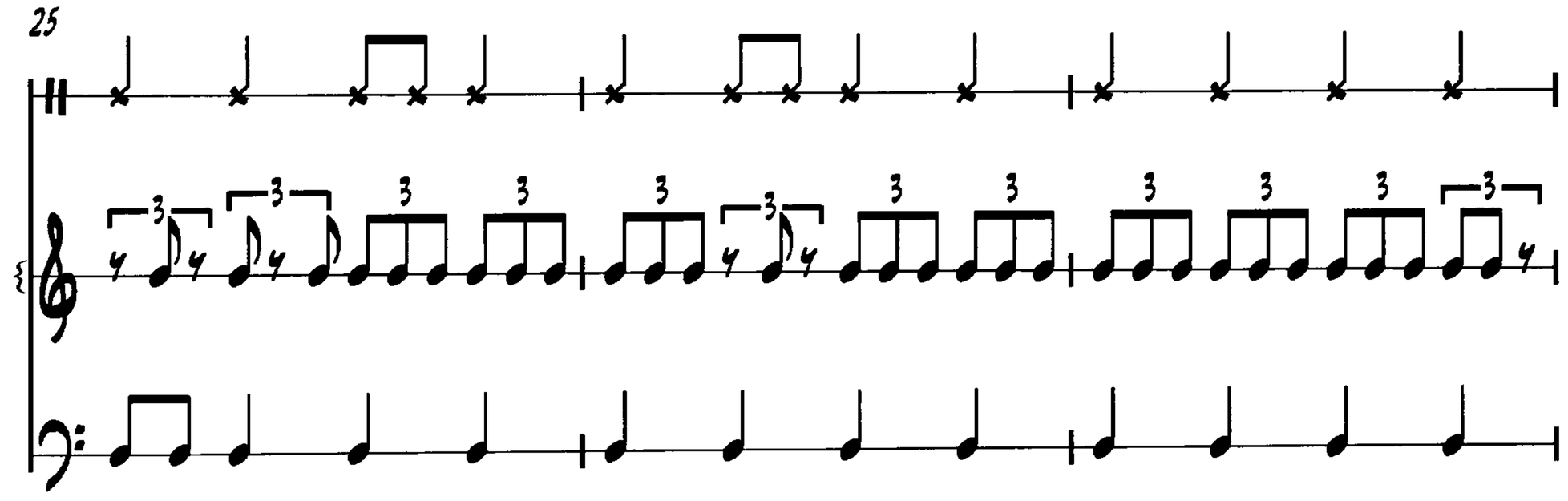

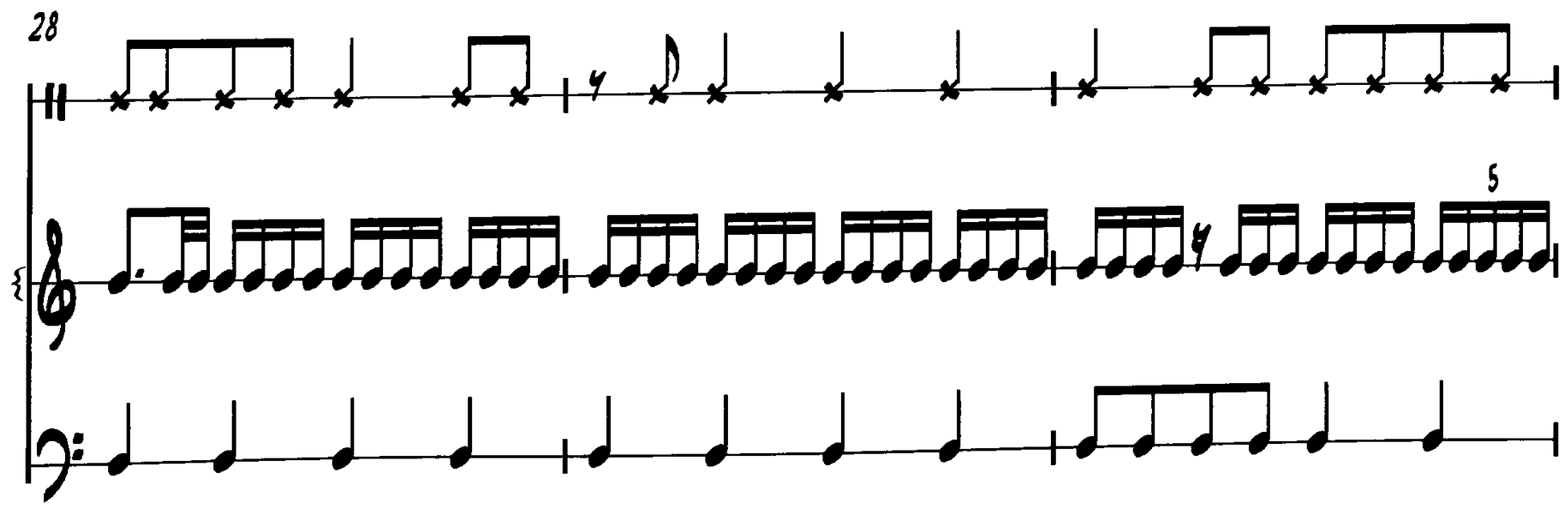

2ND CHORUS

3

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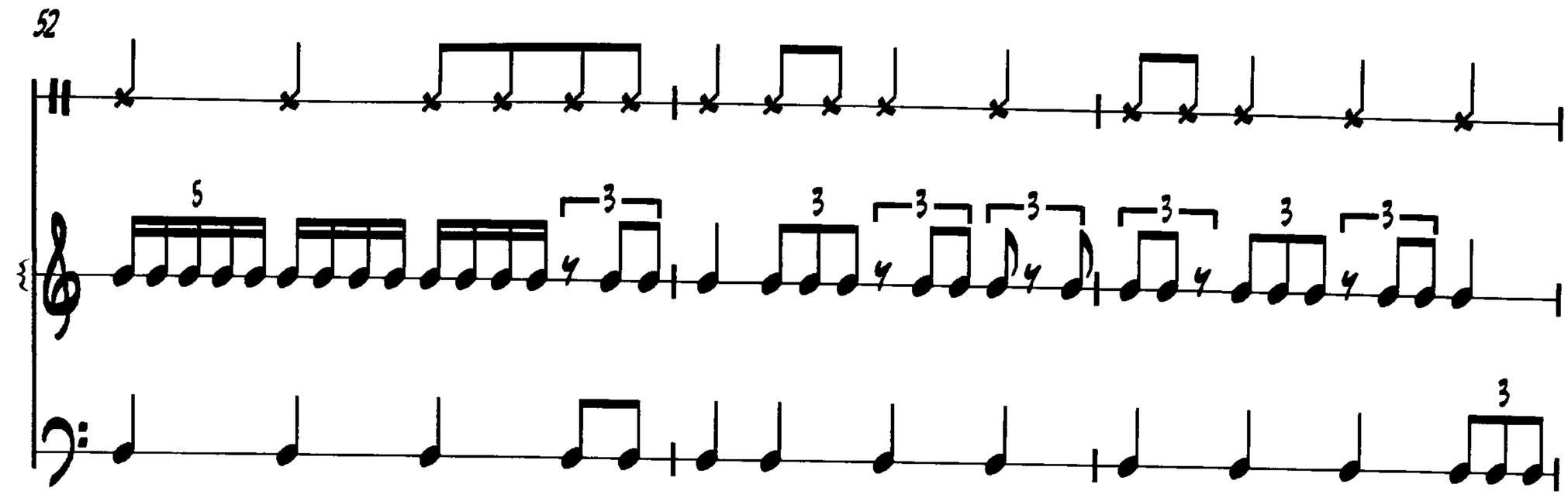
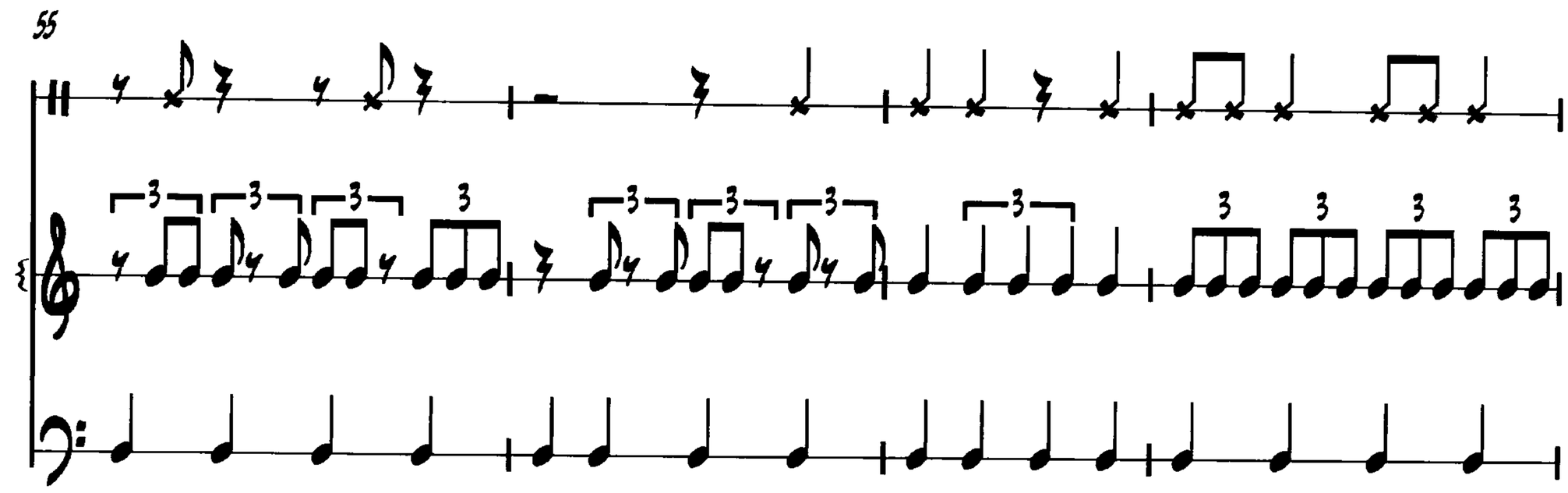
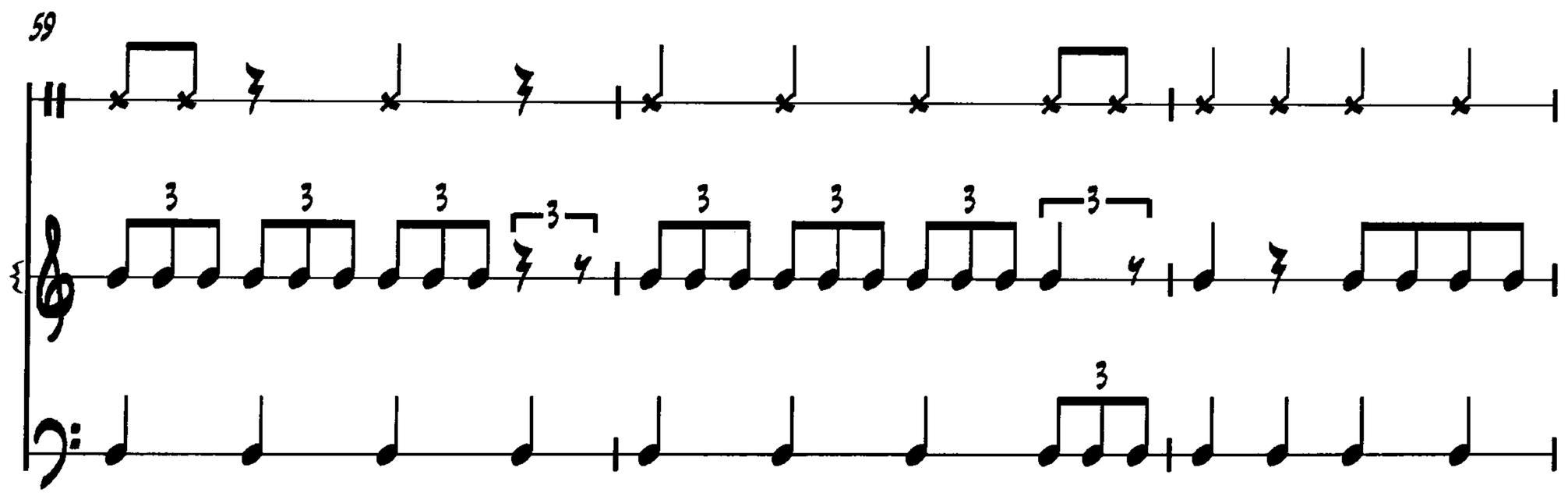
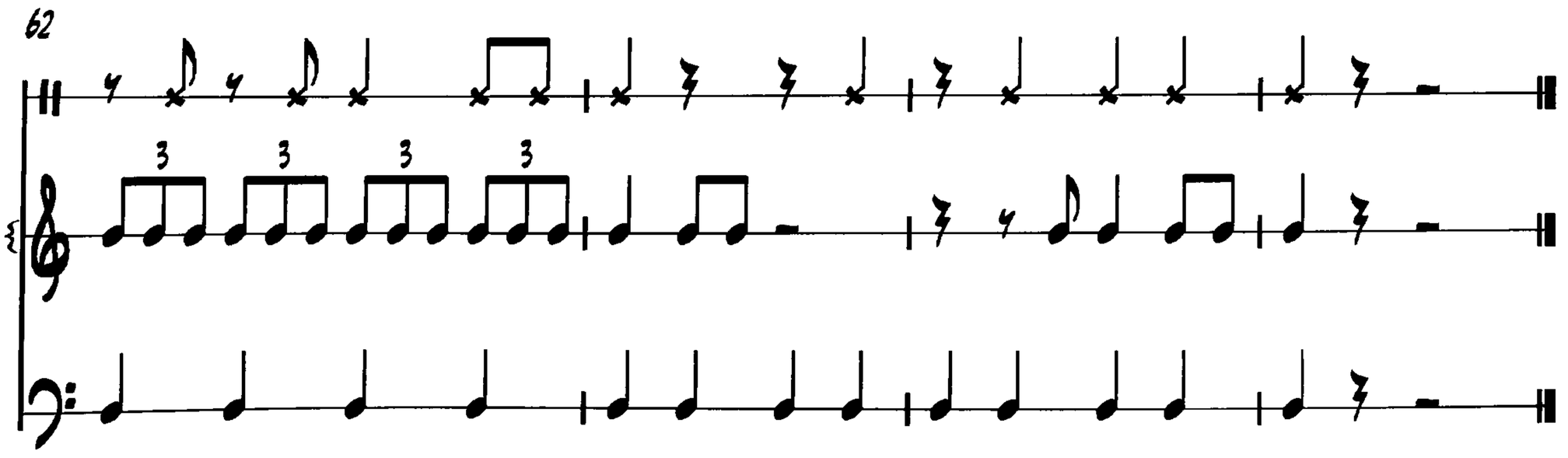
4



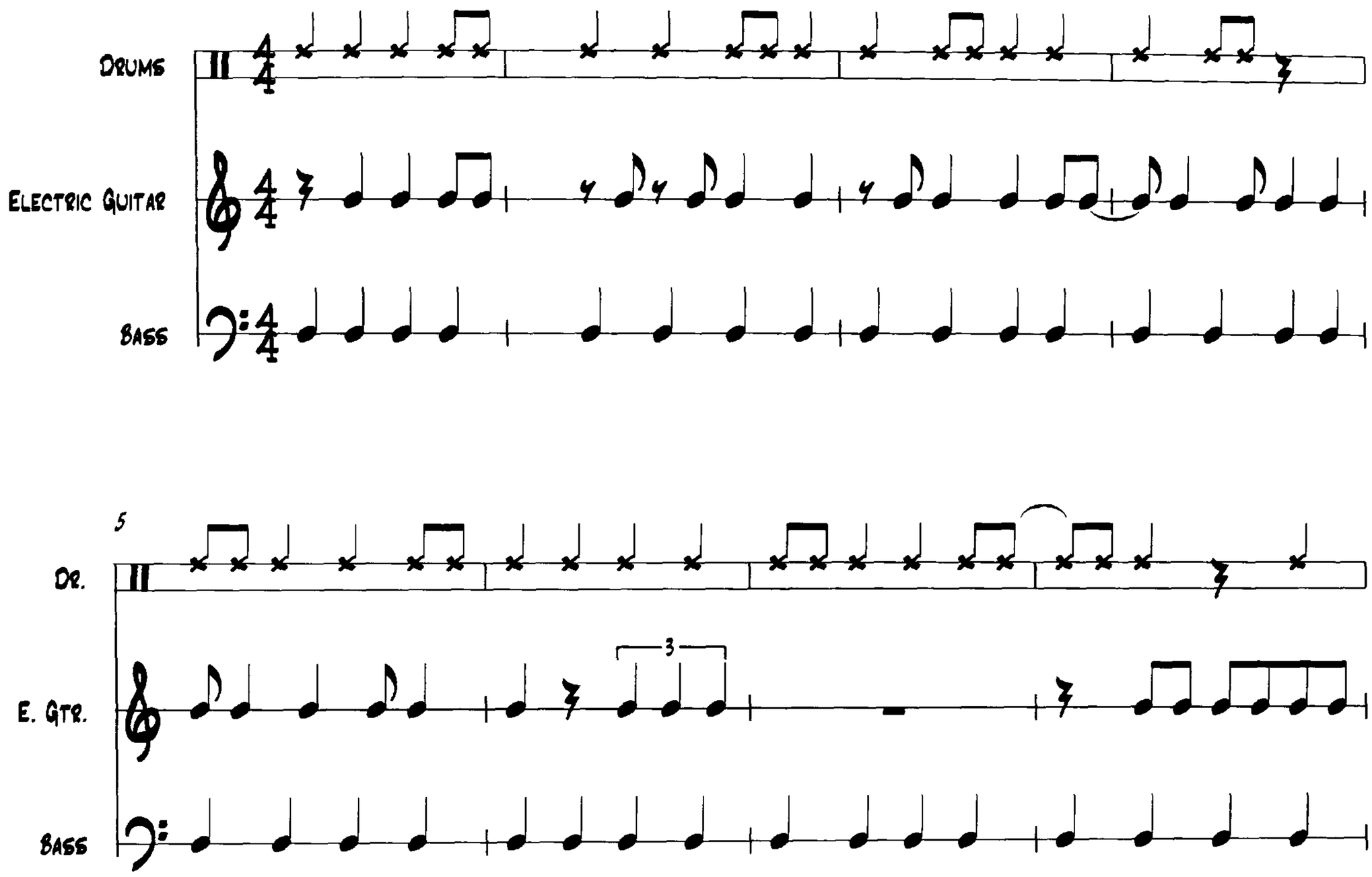






2.3 DC GROUP

SLIPPERS



2

17

Dr.

E. Gtr.

Bass

21

Dr.

E. Gtr.

Bass

25

Dr.

E. Gtr.

Bass

29

Dr.

E. Gtr.

Bass

33

Dr.
E. Gtr.
Bass

38

Dr.
E. Gtr.
Bass

42

Dr.
E. Gtr.
Bass

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Dr.
E. Gtr.
Bass

4

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Dr.

E. Gtr.

Bass

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Dr.

E. Gtr.

3

Bass

60

Dr.

E. Gtr.

Bass

63

Dr.

E. Gtr.

Bass

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